THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIII. No. 2104.] LONDON, SEPTEMBER 8, 1903. [55TH YEAR. PRICE 6d.

PARKER & LESTER,

— ESTABLISHED 1830 —

MANUFACTURERS AND CONTRACTORS, **ORMSIDE STREET, LONDON, S.E.**

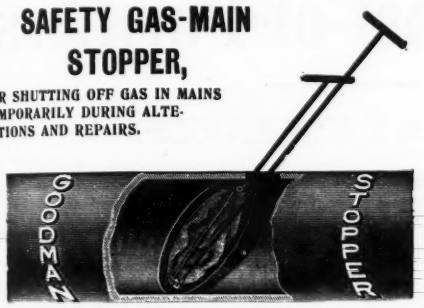
THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

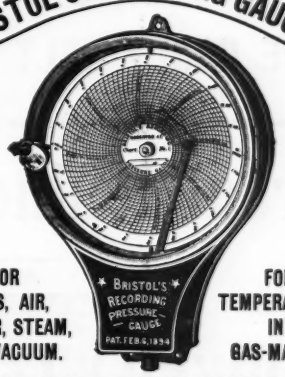
FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION.

BRISTOL'S RECORDING GAUGES



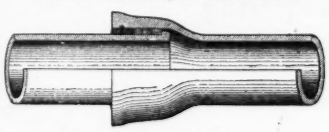
FOR GAS, AIR, WATER, STEAM, OR VACUUM.

FOR TEMPERATURE IN GAS-MAINS.

Many Thousands in Daily Operation.

J. W. & C. J. PHILLIPS,
23, COLLEGE HILL,
LONDON, E.C.

SOCKETS, WEIGHTS, & THICKNESSES



TO ENGINEER'S SPECIFICATION.

VERTICALLY CAST IRON PIPES.

Diameters 1½ in. to 78 in.

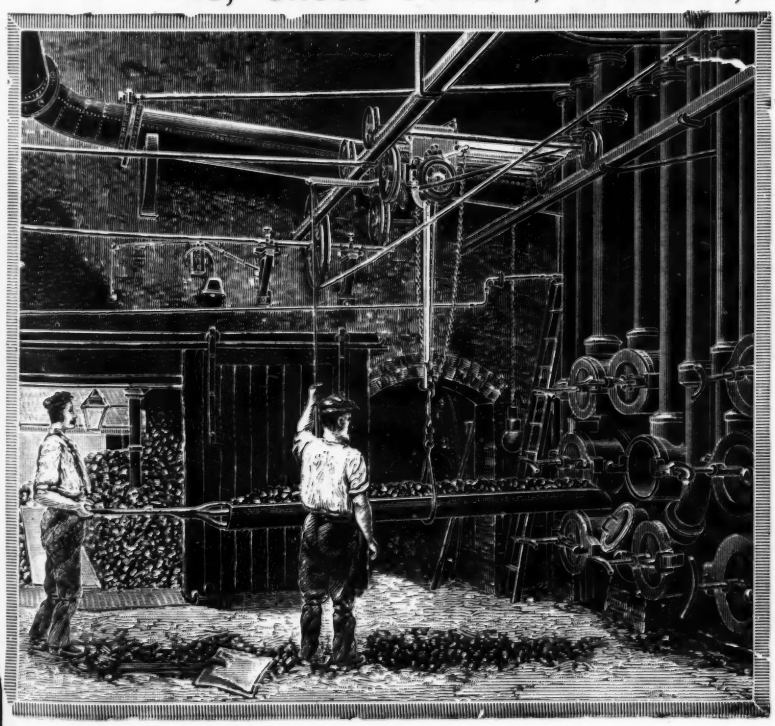
The Best Pipes on the Market and the Cheapest.

A. G. CLOAKE, 54, Holborn Viaduct, London, E.C.

Telegrams: "AMOUR, LONDON." Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

BIGGS, WALL, & CO.,

13, CROSS STREET, FINSBURY, LONDON, E.C.



Telegrams: "RAGOUT, LONDON."
Telephone: 273 CENTRAL.

"RAPID"
MANUAL & POWER
CHARGING APPARATUS,

FOR GAS-WORKS OF ALL SIZES.

Repeat Orders
YEOVIL, NEWPORT, SOUTHBANK, WORTHING, ALDERSHOT.

Machines can be seen working at any of the following Works:—

ALDERSHOT	WREXHAM
WORTHING	SWINDON
YEOVIL	EPSOM
TRURO	SHETTLESTON
NORMANTON	DUBLIN
OTLEY	G. S. & W. Rly. Works
GOOLE	NEWPORT, MON.

GANDY'S BELTING

Holds the World's Record! 41 Prize Awards!

IN A WATER-GAS PLANT, an important item is the Belt for driving the Blower. Ours are specially constructed **Endless Belts,** and have acquired a reputation for this special Work.

CONVEYOR BELTING—A SPECIALITY.

THE GANDY BELT MANUFACTURING COMPANY, LTD.,

HEAD OFFICES AND WORKS—**SEACOMBE, LIVERPOOL.**

This Trade Mark may be seen stencilled on every genuine "Gandy" Belt.

Great Reduction in the Cost of Purifiers

LUTELESS PURIFIERS

WORKED WITHOUT ANY CONNECTIONS AT ALL

(RAMSDEN & SMITH'S PATENT, No. 12,034.)

No complicated arrangement of Valves, each requiring separate manipulation.

No Internal Pipes interfering with Purifying Area.

Every part easily accessible.

FOR PRICES AND ALL PARTICULARS, APPLY TO THE MAKERS:

EDWARD COCKEY & SONS, LD.

Engineers and Contractors for Gas Plant of every Description,

FROME, SOMERSET.

Telegrams: "COCKEYS, FROME." —— Telephone No. 16 FROME. —— Telegrams: "DAMPER, LONDON."

London Office: BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C. Messrs. BALE & HARDY, Agents.

D. HULETT & CO., LTD.

55 & 56, High Holborn, London.

GAS SERVICE CLEANSERS.

LAMP TORCHES.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

PRICE LISTS ON APPLICATION.

THE BARROWFIELD IRON-WORKS, LIMITED,

GAS ENGINEERS & CONTRACTORS

Telegrams: "GASOMETER GLASGOW."

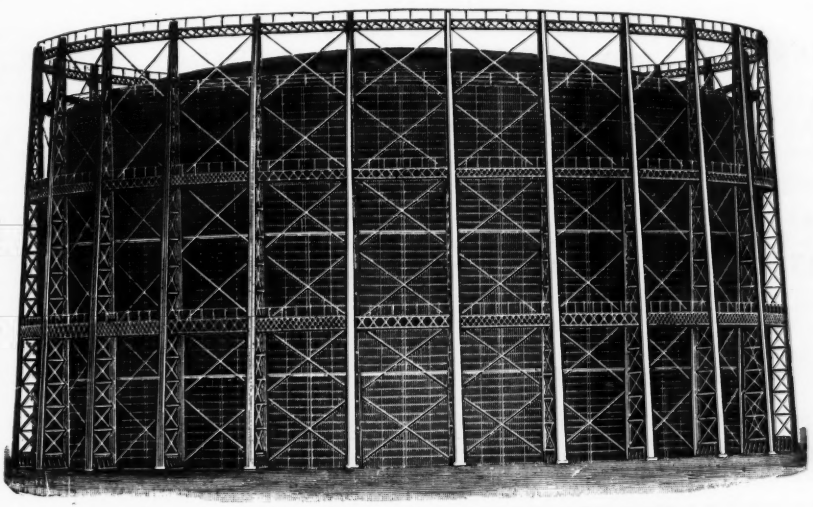
GLASGOW.

OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.



GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS. AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

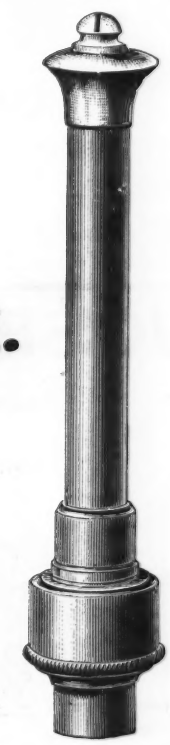
Orme's Regulators

FOR

Ordinary

AND

Incandescent Gas Lighting.



All Information and Prices—

GEORGE ORME & CO.,

Atlas Meter Works,

OLDHAM.

Telegrams: "ORME, OLDHAM."
Telephone No. 93.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: **19, Great George Street, WESTMINSTER.**

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS AND ELEVATORS
CONDENSERS, SCRUBBERS, AND WASHERS.

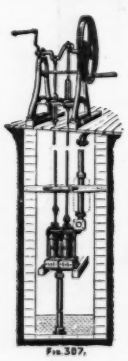
PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS, AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its unrivalled excellence.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

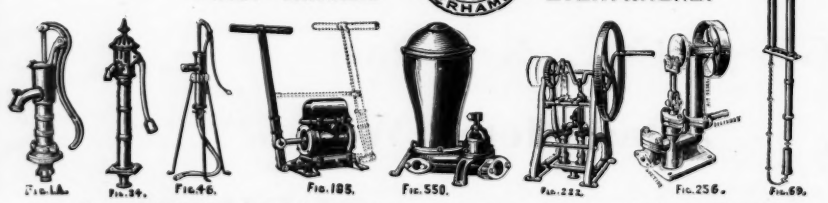


London Address:
Salisbury House, London Wall, London, E.C.

PLEASE APPLY
FOR CATALOGUE No. 8.

TRADE MARK.
FIRST AWARDS EVERYWHERE.

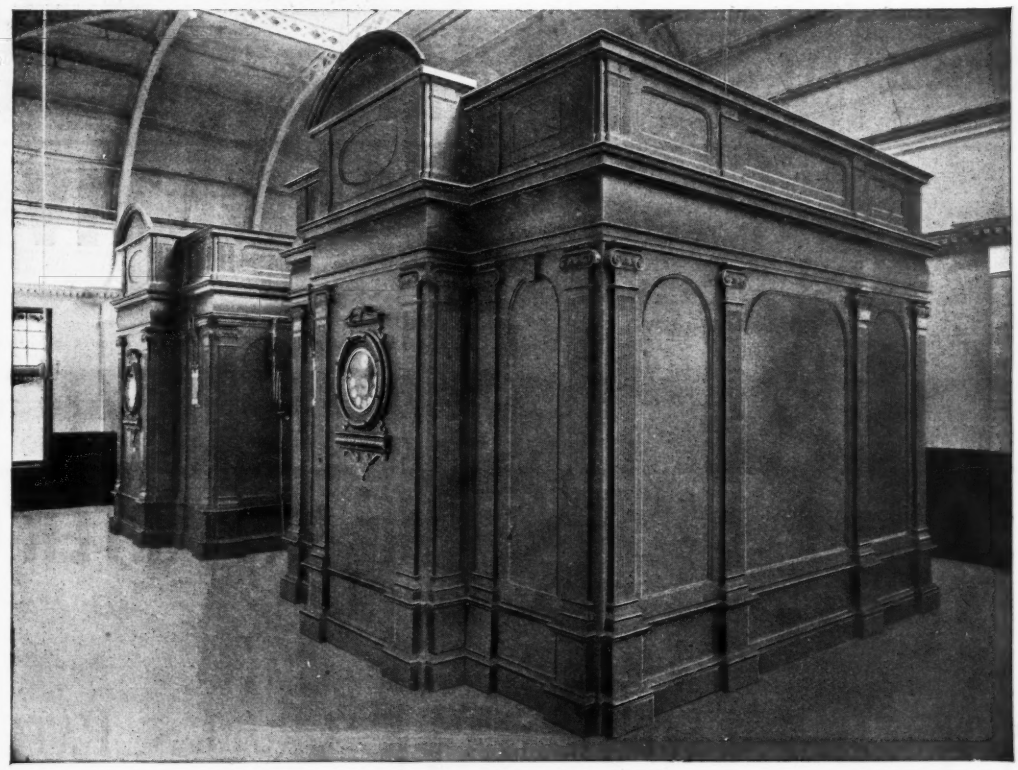
Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 7039.



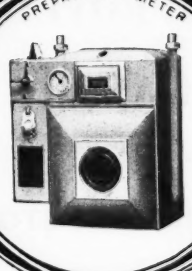
See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

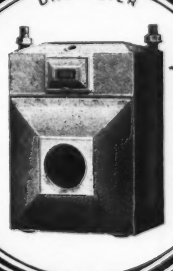
R. LAIDLAW & SON, LIMITED

GAS & WATER ENGINEERS.



TWO STATION METERS, EACH TO PASS 200000 CUB. FT. PER HOUR, ERECTED AT THE GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS





SIMON SQUARE WORKS. EDINBURGH.

ALLIANCE FOUNDRY & ENGINEERING WORKS. GLASGOW.

6 LITTLE BUSH LANE. LONDON. E.C.

PATENT

"STANDARD" CONDENSERS

ADVANTAGES:—

Slow Speed. Large Area for Gas and Water.
Easy access to Interior. Capacity easily increased, &c.

IN USE OR IN COURSE OF CONSTRUCTION:—

	Capacity Cub. Ft. per day.		Capacity Cub. Ft. per day.
GLASGOW	12,000,000	ALDERSHOT	500,000
ANTWERP	2,500,000	RANDERS	500,000
COVENTRY	2,000,000	CETTE	400,000
COPENHAGEN	1,500,000	BARKING	300,000
BURY	1,000,000	PINNER	250,000
SUTTON	1,000,000	HERNE BAY	250,000
GLOUCESTER	1,000,000	PELTON COLLIERY	250,000
SCARBOROUGH	1,000,000	TUBORG	250,000
GUERNSEY	750,000	AALBORG	250,000

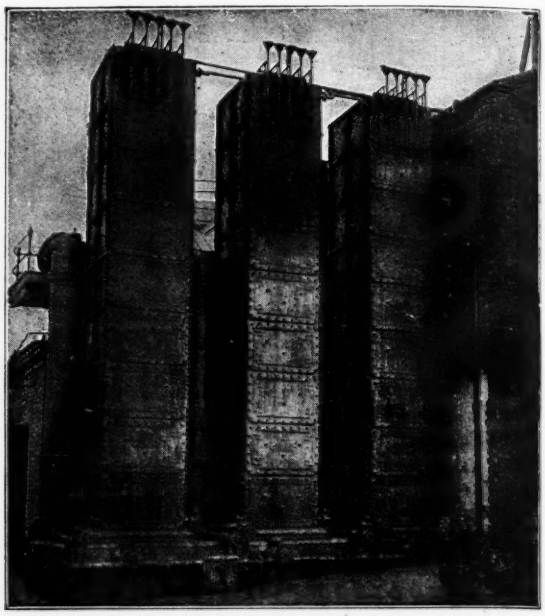
PATENT "STANDARD" WASHER-SCRUBBERS

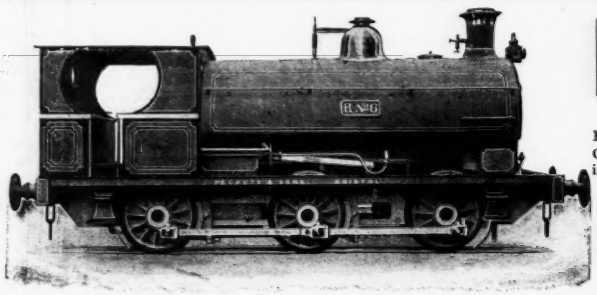
See last and next week's Advertisements.

KIRKHAM, HULETT, & CHANDLER,

LIMITED

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.





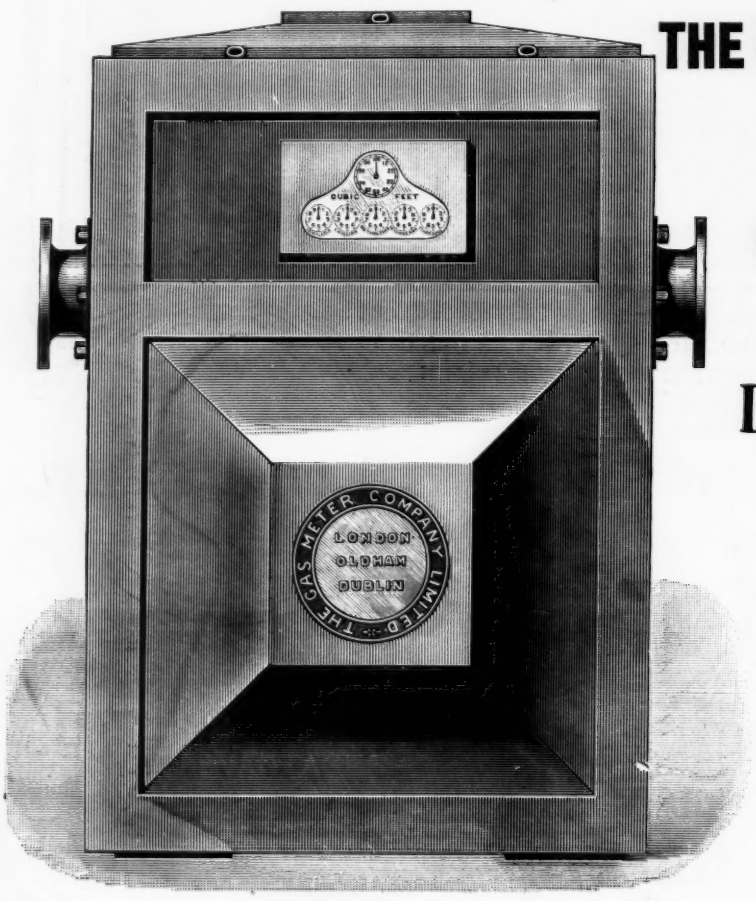
LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."



THE GAS METER CO., LIMITED

CROLL'S PATENT IMPROVED DRY GAS-METERS.

ALL SIZES IN STOCK.

For prices and particulars apply to—

WORKS: 238, KINGSLAND ROAD, LONDON;
UNION STREET, OLDHAM;
HANOVER STREET, DUBLIN;
20, FENNEL ST., MANCHESTER.

Telegraphic Addresses: "METER LONDON." "METER OLDHAM." "METER MANCHESTER."

ALBION IRON WORKS,
MILES PLATTING,

MANCHESTER.

TELEGRAMS—
"STOKER,
MANCHESTER."

WEST'S GAS IMPROVEMENT CO., LD.,

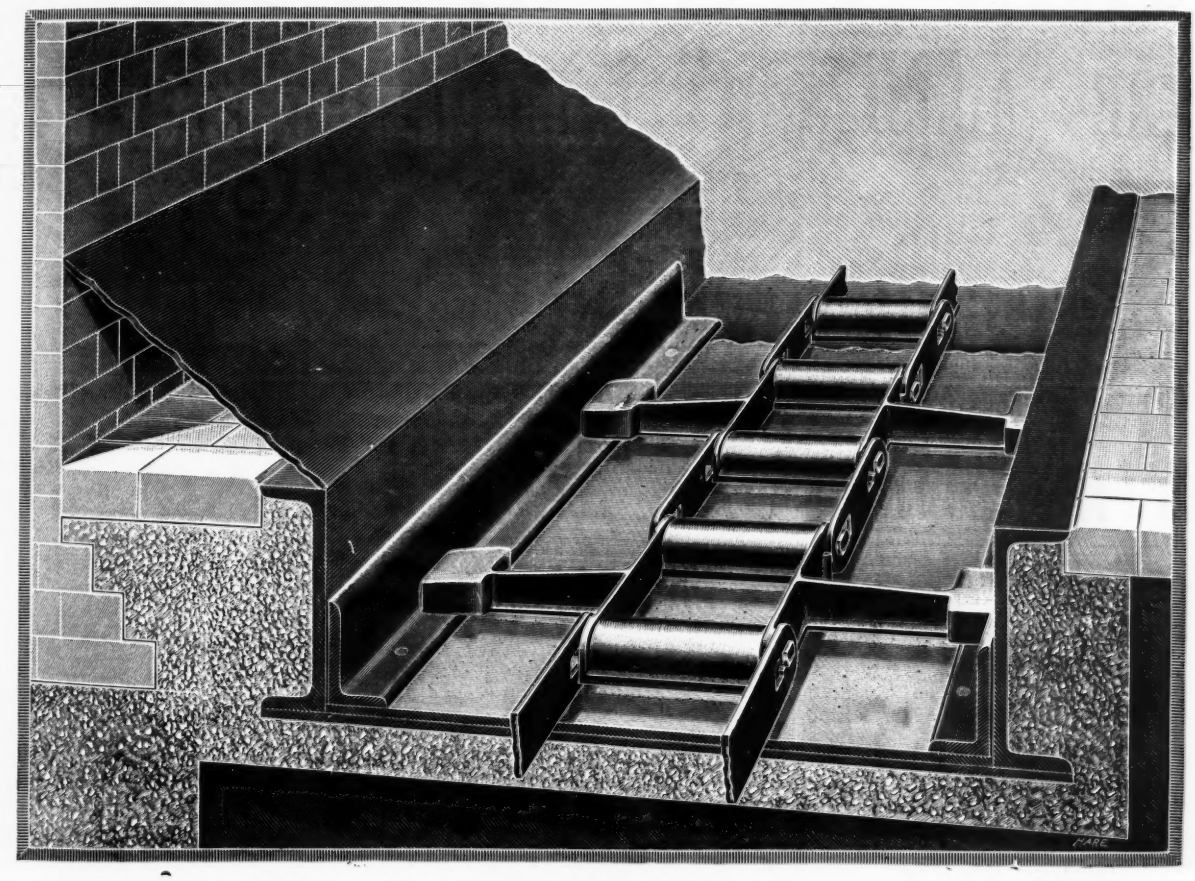
Gas and General Engineers.

CONTRACTORS FOR

COMPLETE RETORT-HOUSE PLANT

. . . EITHER ON . . .

THE HORIZONTAL OR INCLINED SYSTEMS.



SECTION OF

WEST'S IMPROVED PATENT HOT-COKE CONVEYOR,

With Special Chain constructed with a minimum number of parts, and having Large Joint Pins with ample Bearing Surfaces.

WEST'S STOKING MACHINERY— COMPRESSED AIR DRIVEN AND MANUAL SYSTEMS.

COAL BREAKING, ELEVATING, & STORING PLANTS.

BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

Manufacturers for America : **Riter-Conley Manufacturing Company, Pittsburg.**

HENRY BALFOUR & CO.

LIMITED,

LEVEN, FIFESHIRE.

Contractors for the Supply and Erection of all Classes of

Gas-Works Plant.

THE "ANNULAR" BRUSH WASHER-SCRUBBER

(CREEKE'S PATENT).

Made with Cast-Iron or Mild Steel Cylinders.

PRICES AND PARTICULARS ON APPLICATION.

London Representative: MR. HENRY PUPLETT, 47, VICTORIA STREET, S.W.

THE CHEMICAL ENGINEERING CO.

Telephone: No. 2669 AVENUE.
Telegrams: "EVAPORATOR, LONDON."

AND

WILTON'S PATENT FURNACE CO.,

CROWN WORKS, ABBEY LANE, STRATFORD, E.

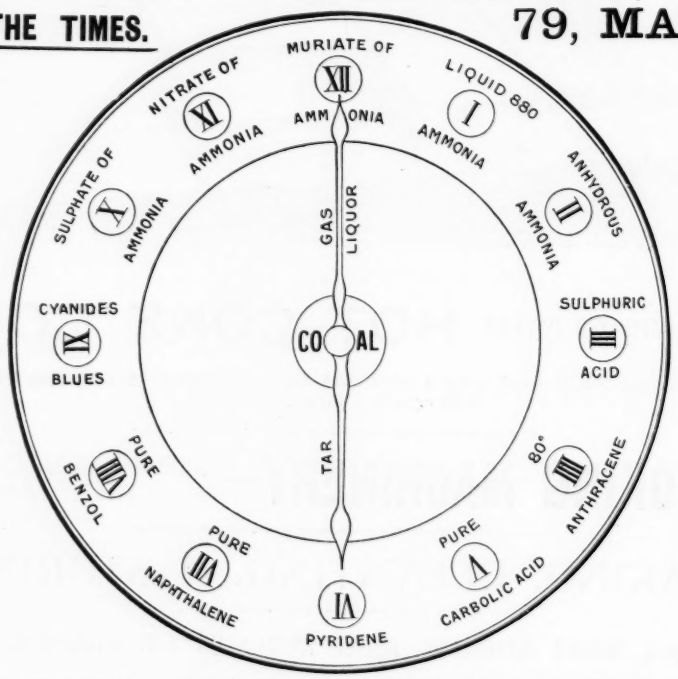
KEEP UP WITH THE TIMES.

79, MARK LANE, E.C.

Contractors for Erection of TAR AND AMMONIA WORKS.

The make of Sulphate of Ammonia from the first round Saturator constructed, has exceeded 40,000 Tons, and the repairs have been practically *nil.*

Can be seen working by appointment.



WILTON'S PATENT SATURATOR AND DISCHARGER

IN USE AT:

Gaslight and Coke Company's Works, Beckton
South Metropolitan Gas Company.
Manchester Corporation Gas-Works.
Burt, Boulton, & Haywood.
Margate Gas-Works.
Longport ,, ,,
Douglas ,, ,,
Worthing ,, ,,
&c.

CONVEYORS and ELEVATORS SPECIALLY DESIGNED FOR THE ABOVE PRODUCTS.

Wilton's Patent Neutralizing Apparatus for the Waste Gases from Sulphate of Ammonia Plant.

CONTENTS.

EDITORIAL NOTES.

GAS, LIGHTING, &c.—

Standard Prices and Qualities of Gas . . 607
Poverty of the Judicial Year in Gas Law Suits 607
Must Municipal Work be Put into Commission? 608
A View of American Trade Unions . . . 608
A Combined Charger and Discharger—Doubts and Experimental Experience—An American Criticism—The Art of Managing Consumers—The Charges against a Glasgow Gas Official—The Credit of Municipalities—The Reproductive Undertakings Return—The Other Side—The Physique of the Working Classes—The Garden City Project . . 609

WATER AFFAIRS—

Trouble with the Croton Dam 611

TECHNICAL RECORD.

Variations in the Lighting Power in the Incandescent Burner of Combustible Gases. By E. Sainte-Claire Deville 617
The Relations between Scientific Research and Chemical Industry—The Products of Coal Tar 619
An American View of the Lewes and Kramers and Aarts Water-Gas Processes 620
Gas-Engines for the St. Louis Exhibition . 621
The Application of Oxygen in Connection with Illuminating Gas 621
Bricklaying in Frosty Weather 622
A New Gas-Burner for Assaying Gold, &c. . 622

ESSAYS AND REVIEWS.

Gas Heating on the Slot System 612
Domestic and Other Interior Lighting . . 612
Natural Gas Literature 613
Gas and Water Stock Market 614
The Fiddes-Aldridge Gas-Stoking Machine . 615
The Value of the Packing in Gas-Cookers . 616

REGISTER OF PATENTS.

Discharging Coke from, and Charging Coal into, Gas-Retorts—Fiddes, W. W., and Aldridge, J. G. W. 623
Furnaces for Gas-Retort Settings—Jeffery, C., and Gibbons, W. P. 623
Dry Gas-Meters—Aron, H. 623
Membranes for Dry Gas-Meters—Aron, H. . 623
Measuring the Supply of Gases, Liquids, and Vapours—Buss, E. 624
Manufacturing Oxy-Hydrocarbon Gas—Turner, C. W. 624
Revivifying Gas Purifier Waste—Jensen, P. (a communication from F. V. L. Hiorth) . 624
Producing Heating Gases Free from Hydrocarbons from Gas-Containing Fuel—Abel, C. D. (Gasmotoren Fabrik-Deutz) . . . 624
Patent Notices 625

MISCELLANEOUS NEWS.

Provincial Gas Companies 625
Australian Gaslight Company 626
Stock and Share List 626
Gas Companies and Electric Lighting. . . 627
Glasgow Corporation Gas-Works—Charges against a Station Manager 628
Gas Fitting by Corporations 629
Arc Lamps or Incandescent Gas for Barnsley 629
Companies Dissolved or Struck Off . . . 629

MISCELLANEOUS NEWS (*continued*)—

Position of the Teignmouth Gas-Works . . 630
Protection of Water Sources at Bristol—Local Government Board Inquiry 630
Notes from Scotland 632
Current Sales of Gas Products 633
Coal Trade Reports 633

PARAGRAPHS.

Personal and Obituary 616
Gas from Septic Sludge—Zurich and Its Municipal Enterprises—Thawing Frozen Ground—Amendment in the Canadian Patent Law 616
Eastern Counties Gas Managers' Association 621
British Rainfall Statistics—Municipal Trading Committee's Report—Visit of Junior Gas Engineers to Beckton—Southern District Association of Gas Engineers. 622
Ottoman Gas Company, Limited 631
Horwich Water Supply—Extraordinary Waste of Water at Sittingbourne—Kingsbridge Water Supply—Preston Water Supply . . 634
Vyrnwy Water for Wallasey—Gas Explosion at Buckingham Gate—Free Gas-Stoves in Birmingham—Public Lighting of Rochdale—Street-Box Explosions in Sunderland—Reductions in Price—Public Lighting Scheme for Darfield—German Chemical Trade in 1902—Cheap Gas for Generating Electricity at Hebden Bridge. 635
Fire and Electric Lighting—Gas and Electricity at Southport—Heywood and Middleton Water Board—Attraction of Light and Water for Mosquitoes 636

Messrs. HUMPHREYS & GLASGOW

AND

THE UNITED GAS IMPROVEMENT CO., U.S.A.

CARBURETTED WATER-GAS PLANT

— *DOUBLE SUPERHEATER SYSTEM.* —

H. & G., LONDON **136,700,000** Cu. Ft. Daily

U. G. I. CO., U.S.A. **373,200,000** Cu. Ft. Daily

TOTAL 509,900,000 Cu. Ft. Daily

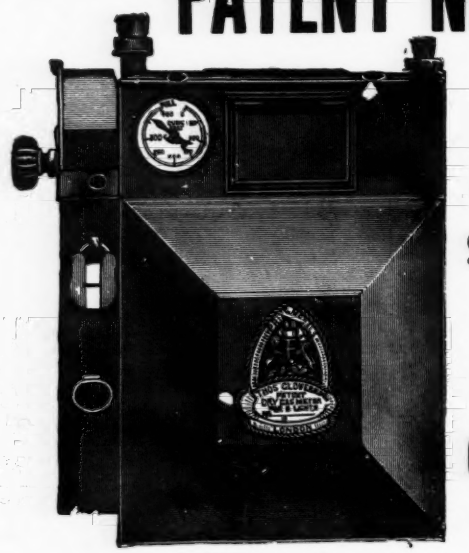
Messrs. HUMPHREYS & GLASGOW,
38, Victoria Street, London, S.W.
31, Nassau Street, New York.

THE UNITED GAS IMPROVEMENT COMPANY,
Philadelphia.

Telegrams: "EPISTOLARY, LONDON."
"HUMGLAS, NEW YORK."

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." **Telephone No. 6159 Bank.**

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

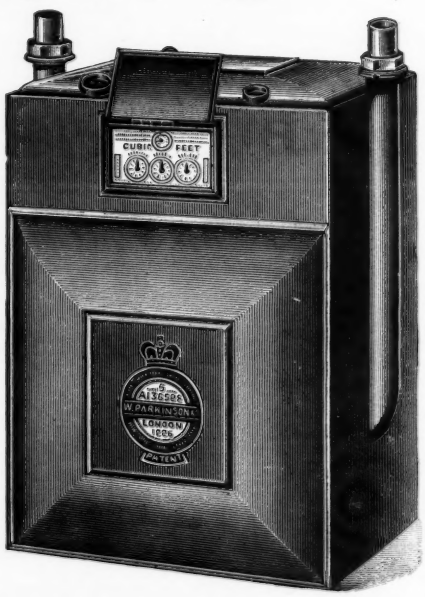
Telegraphic Address: "GOTHIC, LONDON." **Telephone No. 6159 Bank.**

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET.	57 & 58, BROAD STREET.	132 & 134, CORN EXCHANGE BUILDINGS.	26, WEST NILE STREET.	8, EXCHANGE PLACE, DONEGALL STREET.	23, WRIGHT'S LANE, LONSDALE STREET.
Telegraphic Address: "GOTHIC."	*Telegraphic Address:* "GOTHIC."	*Telegraphic Address:* "GOTHIC."	*Telegraphic Address:* "GASMAIN."	*Telegraphic Address:* "GOTHIC."	
Telephone No. 1005.		**Telephone No. 3898.**	**Telephone No. 6107 Royal.**		

PARKINSON'S

WET & DRY

Gas-Meters.



GUARANTEED FOR

5 YEARS.

PARKINSON AND W. & B. COWAN, LTD.
(Parkinson Branch),

COTTAGE LANE, CITY ROAD, LONDON.

BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXIII., No. 2104.—TUESDAY, SEPTEMBER 8, 1903.

EDITORIAL NOTES.

Standard Prices and Qualities of Gas.

THE question of the equitable adjustment of the initial, or standard, price of gas to compensate for any possible alteration of the standard of illuminating power which may be found expedient on industrial and commercial grounds, is one that lies at the very root of the gas politics of the hour. In theory, as we have willingly admitted, there should be such an adjustment, on the principle that gas companies ought not to benefit financially to any greater extent from the manufacture and distribution of one grade of gas in lieu of another. So long as the statutory and equitable dividends, and other capital charges on the undertaking, are provided for, the company ought to be satisfied to carry on their business to the satisfaction of their customers in every possible way, including the supply of the most suitable make of gas at the most reasonable price. Were this rule ignored, it is conceivable that a gas company might attempt to force upon the public a more expensive description of gas than is required, to suit their own convenience in certain respects. Such a contingency is not very probable, perhaps; but it is not inconceivable, in the case, say, of a limited concern with no particular reason for desiring to extend the consumption. Remembering how hard some companies have been, and still are, to persuade of the advantages of selling gas "by the pennyworth," it must be agreed that the policy of doing a cheap and popular trade is not accepted for granted by all gas manufacturers, any more than the third-class season ticket branch is altogether admired by railway companies. The observation has been made that it would pay better to blow all the gas consumed by prepayment meters into the air, than to have the trouble of this class of business. This is an extreme way of stating the case; but it has a sufficient substratum of truth to serve as a warning that the popularization of gas by the business methods now in fashion will not bear extraneous burdens imposed with too exclusive regard for consumers. The producer must also be considered.

Essentially, as we had occasion to point out recently, the fundamental difference between the Cobdenite theory of the action of supply and demand in commerce, and that which appears to be rising on the economic horizon, centres in the hypothesis of the former that if the interests of the consumer are safeguarded, the manufacturer and vendor can be trusted to take care of themselves. Wherever it has come to pass that the producer was crushed and his business destroyed by the conditions created in this sense, Cobdenism had no pity for him. He had no right to carry on his trade at all, if he could not make it pay! John Bright used to say, in all good faith, that if the English agriculturist could not grow wheat in competition with the foreigner, it was due to the unsuitability of his land for the purpose. Cobdenism would have seen every plough in England rust, with perfect equanimity, in the confident belief that all the corn necessary to support the population of this country, could be imported more cheaply than it could be grown. But then, it must be remembered, it was the opinion of the school that all foreign spears would infallibly be turned into plough shares, so soon as it should appear that the latter is the more profitable form of ironmongery. Circumstances do not at present seem to favour this belief. It could never have been entertained at all, if an alternative source of food-stuffs to the home-grown had not been in evidence. The severest form of the Utilitarian philosophy never countenanced the complete extinction of any source of the necessaries of life, or the cessation of a kind of productive employment, except on the supposition that something economically preferable could be found to take its place. As regards the supply of gas to towns, this is what cannot be shown. The world wants gas, and there is nothing that could take its place. To carry the argument farther, and say that the world wants its gas cheap, as well as suitable for all the uses to which it can be put, as these arise from time to time, is only to illustrate the truth that the supply of gas is a trade like another, and must adapt itself to whatever fresh circumstances may occur.

These reflections bring us back to the question of how those who are responsible for the conduct of the gas industry, including the Legislature, should regard the proposition that the conditions, both of manufacture and use, may change. Granting this as a possibility, of which those who are actually engaged in the industry must be the best judges, as they are the first to feel the pressure of new developments, should the standard prices be altered, as a matter of course? There need be no hesitation in answering this query emphatically in the negative—that is to say, so far as the prospect of such changed conditions opens up for the present. The effects of such economies of manufacture as it may be found expedient to introduce, will have their natural influence on the revenue account of the undertaking; and it should be left at that for the time being, at any rate. It is not necessary to say much in this connection about the value of the sliding scale; because this is an arrangement that applies only to companies, and the case of municipal gas undertakings should not be left out of consideration. Let gas everywhere be manufactured and vended on the basis of the best value for money—taking care that no fictitious elements of value are reckoned in. It is impossible to pronounce off-hand as to what really constitutes the value of a gas supply. The factors differ in different places, and change from one year to another. At the era when Parliament and the Board of Trade followed the rule of putting the illuminating power of gas at what was recognized as the conventional standard, if this involved a rise in the figure, the circumstance was never allowed for by an increased price. So, now, if to drop a candle or two on the photometrical test would mean cheapened production, it should be left to the ordinary course of trade to show the effect. Otherwise, there will be no movement in the direction of cheapness at all, in doubtful cases. Moreover—and it is the strongest argument of all—no improvement of gas manufacture at present in sight on the technical horizon, is of such positive moment as to outweigh the contemporary variations of works cost, due to ordinary everyday market influences. So much appeared in a striking way in the address of Sir W. T. Makins to the proprietors of the Gaslight and Coke Company, at the last general meeting. It is impossible to follow this particular statement of the affairs of the Company for the previous half year without receiving the impression of how much the non-technical matters weigh in making up the balance of a great gas undertaking over a lengthened period. It is almost enough to cause the most ardent of innovators in regard to methods of manufacture to despair of the part of engineering in a business of this character. It would need remarkably good engineering to save a shilling a ton on the coal carbonized; yet the turn of the market, with a little improvement by way of residuals, is competent to effect as much in any year. Of course, the advantage may vanish just as quickly as it appeared; but it may also carry with it all the benefit that the careful engineer or the devoted manager has striven to secure. Wherefore, the Legislature should not try to drive the gas industry on the curb. Better give the engineers their head, and let them do their best, under the guidance of sound commercial views, for the complex interests that are confided to their charge. Otherwise the old adage about penny wisdom and pound foolishness will assuredly receive a fresh illustration.

Poverty of the Judicial Year in Gas Lawsuits.

THE judicial year has come to an end, and the lawyers have scattered for the Long Vacation, which remains one of the most remarkable of the features of our national judicature system. The reflection that must naturally occur to any follower of the gas industry in this connection, is that there has been singularly little gas litigation of importance for a long time past. One might be puzzled to find a reason for this absence of notable lawsuits relating to the subject matters of so large an industry as that of gas supply; but

the fact is something which is to be regarded as very satisfactory. Moreover, in respect both to the secretarial as to the executive side of gas companies' work and responsibilities, there have been very few decided cases bearing inferentially upon the companies' affairs. Mr. H. D. Ellis had occasion to mention one or two matters of this character at the recent meeting of the Commercial Gas Company; but, speaking generally, there has been no freshly-made case law of which gas officials need take notice. Patent cases have apparently ceased to trouble the Chancery Judges at all. There never has been such a lull in litigation of this class. It is perhaps a question whether the new arrangements for dealing with disputes respecting patents are to be credited with producing this good result; but, whatever the cause, the fact remains in evidence. There is reason to believe that the new Patent Law is working well in other ways; for which patentees may well be thankful. At the present time, when so many questions of the gravest importance as regards the economical dispositions of the kingdom are being canvassed, it is interesting to remind professed believers in the principle of letting things alone, that the Legislature has already found it expedient to make certain adjustments of the Patent Law, which may be characterized as intended to protect the national industry from abuses of the liberty with which English patents were once granted to all applicants. Yet our national patent system remains the freest and simplest in existence. It is less oppressive to manufacturers generally than any other, and is both in spirit and in operation absolutely equal to all patentees, whether native or foreign, which is more than can be said for all patent systems. Litigation under the Workmen's Compensation Act has not been so plentiful as certain opponents of this measure predicted, and possibly desired. With remarkable celerity, considering all things, the Courts have interpreted the law of workmen's compensation for personal injuries received in the course of their ordinary employment; and the decisions will materially help in facilitating the extension of the principle which is bound to come before long. On the whole, the freedom of the gas industry itself from litigation of a heavy or vexatious description is not singular, but has been shared by many other manufacturing and commercial interests. That is to say, the Law Courts have been busy with personal matters, which fill the papers and do not interfere with trade.

Must Municipal Work be Put into Commission?

The painful impression caused by the action of the Corporation of the City of London, declared to be legal by the House of Lords, in repudiating the old Commissioners of Sewers' electric lighting contracts, appears to deepen with time. Of course, there are two kinds of interest manifested in this subject, by those who profess to form or to follow public opinion. One refers to the personal aspect of the story, and is chiefly concerned with the "scandals" with which the early history of electric lighting in the City of London was encrusted. It gratifies a certain order of mind to reflect that Lord Mayors are occasionally as human as themselves. This aspect of the matter, however, is not a very profitable study. Neither is it any business of ours to speculate here as to how the actual electricity supply of the City stands affected by these ancient histories. There is an aspect of the general question, however, in which every citizen and ratepayer is interested; and that is, as to how the business of modern municipalities is to be carried on, if the spirit of the House of Lords' judgment in the present instance is to be acted upon with respect to the contracts of these bodies. Of course, it is only the Corporation of the City of London which is affected directly by the provisions of the Commission of Sewers Act, 1848; but anyone who will read the commentary upon this enactment and its effects, contained in the letter of Sir Homewood Crawford, City Solicitor, in "The Times" of the 3rd inst., must be struck with the gravity and far-reaching character of the matter. It bears an intimate relation to those other corporation scandals with which the country has been rendered too familiar of late. For in all parts of the United Kingdom trouble has arisen through the mixing-up, in some cases unintentional, of the public duties and private interests of persons who happened to be shareholders in joint-stock companies as well as members of local authorities. The law is very explicit and severe upon this head; yet so extensive are the ramifications of modern finance that, if extreme views of common facts were to prevail, there is hardly any saying what corporation contracts might be invalidated. The issue is not confined to the class of construction contracts, but involves financial dispositions of the first order of importance. It is admitted that the Sewers Act of 1848 does take an extreme view of the responsibilities of members of the Commission; and it has been argued in some quarters that this severity is just.

If the judgment is to prevail, there is obviously only one safe course to take, which is, to place the executive departments of local authorities in commission. As time passes, the difficulty of finding men competent to discharge the duties of local self-government, who are not shareholders of any company likely to have relations with the municipality to which they belong, will increase rather than diminish. Nobody pretends that the principle involved in this discrimination is either small or one that can safely be infringed. Difference of interest is the foundation of independence; and where there is no independence there can be no impartiality. These observations may smack of the copy-book heading; but they are valid for all that. It does not seem to have been pointed out that the position of a shareholder in a joint-stock company prior to 1848 was wholly different from that which obtains under the existing rule of the principle of limited liability. Perhaps it does not matter. The only important point to be considered is this: That if members of local authorities who may be required to deal in their public capacity with loans and works are to be bound over by a declaration of absolute disinterestedness, these matters will have to be entrusted to paid permanent commissioners. This may be a good thing in the long run, or it may prove disappointing. It ought not to be overlooked, in discussions upon this subject, that there are other elements to be considered besides the point of disinterestedness. Among these is the circumstance that members of elective bodies without any standing or experience in affairs, are often thrust into positions for which they would otherwise be esteemed to have no adequate qualification. There are instances of men sitting in committees with heavy contracts to deal with, who live in domiciles rated at very low figures. This is not to say that presumably poor men are not competent to have anything to do with municipal administration, but "there are degrees," as the French observe, and it is impossible to feel implicit confidence in the judgment of essentially small men in regard to transactions of a magnitude to which they are naturally strangers.

A View of American Trade Unions.

Those hasty critics of all things British who profess to see so vast a superiority in the industrial methods of the United States, ought to correct their views of the latter by careful study of the career of Samuel Parks, erstwhile "walking "delegate" of the Housesmith's and Bridgemen's Union, which controlled the labour of the men employed in the erection of the steel-framed buildings that constitute the boast of New York. It is not our business to deal at any length with the history of this fine flower of Trade Unionism, who could only have bloomed in a country whose judicial system has been almost democratized to death. Suffice it to remark, that the story of Samuel Parks furnishes ample corroboration of the wisdom of English employers of labour who refuse to "recognize" Trade Unions, not merely in their own interest, but also for the sake of the workmen themselves. The man named has recently been convicted of, and sentenced for, practising an exaggerated system of blackmailing of employers, in the name of his Union; but for solely his own benefit. His method was simplicity itself. All he had to do was to go to a contractor who was pressing on with a job of building, and demand immediate payment of a lump sum amounting to hundreds or even thousands of pounds, on peril of having all his men called off. Sometimes, it seems, this was done at the instigation of a rival contractor. The men obeyed the orders of the walking delegate implicitly, and continued to do so after his rascality was exposed. He had a defence, of course. He alleged that the money he received was paid for the benefit of the Union. It was explained to be payment for "waiting time" and also for fines. Waiting time means the time represented by a strike; so that in this happy state of affairs industrial, the employer is called upon to pay men who have struck against him more for the time they have not worked than for the time profitably occupied. It is

scarcely credible; but it is reported that the Court of Appeal of the State of New York have pronounced the demand of a Union for waiting time and for fines perfectly legal. No wonder the Westinghouse and other American engineering companies are emigrating. The case of Samuel Parks is not singular. On the contrary, he has many compeers who have found the position of walking delegate an extremely lucrative one, thanks to the servility of workpeople and the cowardice of employers.

It is to be understood that the Unions which are now threatening the industrial future of the United States do not even pretend that their members have any complaint against the employers in respect of wages, hours of labour, the employment of non-Union labour, or anything else. This fact disposes of the sentimental defence of labour organizations commonly relied upon in England—namely, that without such societies workpeople are powerless against their natural enemies, the employers. Where Trade Unions exist and are most powerful, as in the United States, they fail to provide a remedy against the most crying evils of the universal industrial system, including the using-up of men as though they were machines, and the worst results of the wage system of payment for labour. In theory, they should do all this; but in practice they do nothing of the sort. In common with all forms of Government yet devised by mankind, the organization of labour ever tends to benefit the organizers more than the organized. Engineers know what is meant by the internal work of a machine. In mechanical science it is the difference between the energy put into a machine and the work obtained from it. In a prime mover, it is the loss between the indicated horse power and the power measured by the brake. It is the besetting weakness of all governments, that this fraction continually tends to grow, until it approaches so near unity that the machine ceases to be worth running at all. Democratic institutions unfortunately have a very large fraction of inefficiency; and Trade Unions seem to exhibit the largest of all ostensibly practical organizations.

A Combined Charger and Discharger.

Visitors to the Bristol Gas Company's works will perhaps remember that the name of Fiddes has not been identified to any large extent with the adoption in practice of retort machinery; and yet the carbonizing costs have been such that those bearing the name, and who were for so many years associated with the engineering work of the concern (before Mr. D. Irving succeeded to the position of Chief Engineer), had no occasion to be ashamed of those costs. Under the circumstances, it may come as a little surprise to find that Mr. W. W. Fiddes is associated with another in a piece of retort-house mechanism that reaches, if it is workable, the ideal of discharging and charging horizontal retorts—and that is the consummation of the two operations simultaneously. But even this is not the first time that Mr. Fiddes has appeared as an inventor in this class of machinery; for, looking over our patent records, it is found that, as far back as 1893 and 1895, he had alighted, but nothing more, on the tracks of the new Continental inventions in this line. In 1893, he applied for a patent for a steam or air blast shoot for projecting coal into retorts, and two years later for a ram for discharging through retorts. The reason he did not proceed at the time with the development of these proposals will be gathered from an article appearing on p. 615. However, the experience then led Mr. Fiddes to the conclusion that what was wanted was a machine that would perform simultaneously the dual operations of charging and discharging. Hence the present invention, which is illustrated and described to-day.

Doubts and Experimental Experience.

The combined charger and discharger is a development of the ram; and, of course, it is only applicable to through retorts. The charge of coal is carried within the length of the ram; and, in fact, the latter may be likened to a push-plate conveyor. It follows that, when the head of the ram has reached the farther end of a retort and cleared out the spent charge, and is raised for withdrawal, the coal within its length is simply deposited in the retort. The sides of the ram are constructed of plates—if the house is wide enough to permit of it, rigid the full length; or, if not, in jointed parts, and wound on to a drum. The sides are held together by means of distance-pieces, with swinging push-plates adapted to push the coal from a movable dead-plate outside the bench on to, and along, the bottom of the retort; the swing-plates being useful for levelling the charge on the return journey. On first consideration, the idea at once occurs that, the proposal being to make the apparatus of sufficient size to carry a complete charge into the retort in one operation, the part entering the retort will be somewhat cumbersome; and experience with mechanism having movable parts working in and out of red-hot retorts also raises a little doubt on the score of the swinging-plates and the hinged side-pieces. The handling of a large dead-weight concurrently with the forcing out of a spent charge also points to the requirement of considerable power. But the notes with which Mr. Fiddes has kindly supplied us, and from which the short article appearing elsewhere has been prepared, suggest that any fear in respect to these matters is altogether groundless—the success of the invention having been already demonstrated at the Bath Gas-Works by an experimental machine. Mr. Fiddes's old colleagues will be glad to have this convincing testimony of the retention by him of keen interest in gas engineering affairs, notwithstanding his retirement from active service.

An American Criticism.

The reprinting in American contemporaries of the recent papers by Dr. Steger and Mr. S. O. Stephenson—the first on "Water Gas Manufacture by the Kramers and Aarts Process," and the second on "The Lewes Process at Tipton"—has produced a little criticism by Mr. F. C. Slade, of Yonkers. There is nothing in it of much importance; but still what he has to say on the subject will be of interest as being the experience of an American gas engineer on the utilization of blue water gas in connection with coal gas manufacture. Mr. Slade does Mr. A. G. Glasgow a great injustice when he expresses surprise that gas engineers on this side did not know—this is the gravamen of his criticism—of the American experiences of some years since of systems somewhat akin to what is known in England as the Lewes process—so known because Professor Lewes was the first to bring it prominently before gas engineers here, and to carry out a series of experiments in connection with it. An indication of what had been done previously in America has been brought to knowledge in the course of controversy in our pages; so that gas engineers in this country are not altogether so ignorant on the point as the critic supposes. But he must really forgive the writers of these papers, as in this and neighbouring countries it is found impossible in every contribution to the subject of water gas to go back to the time of the flood. However, Dr. Steger, and all who are interested in the utilization of blue water gas in this country, will no doubt read with considerable interest and pleasure the brief narrative of the experience of Mr. Slade, the gist of which is found in the final paragraph: "It is the opinion of the writer that when Professor Lewes has had the fickleness of water gas in coal-gas retorts sufficiently impressed upon him, he will gladly forego even the benefits derived from the light oils in the tar, and be contented to mix his gas in the purifiers, the same as common, ordinary gas men."

The Art of Managing Consumers.

Mr. D. Decker, of Santa Rosa, Cal., must be a gentleman with just the proper mixture of all the different qualities that go to make up the necessary temperament suitable for a gas manager to carry him through all the difficulties which he has to encounter in his dealings with gas consumers. At any rate, if he does not himself possess all the essential qualities, he knows what they are, for he parades them one after the other in a paper which he read before the last meeting of the Pacific Coast Gas Association, at San Francisco. When a consumer comes to him and he happens to be a "first-class high kicker" whatever that may be, Mr. Decker opens by treating him to a little pleasantry; and when he gets the consumer into a good humour, he then tries to convince him that he (Mr. Decker) is personally interested in his case, by reminding him that the Company's business depends for its success entirely upon the goodwill of their patrons. That is all very sound. But then the consumer must be made "to feel that the manager is human, that he is sympathetic, that"—what is this?—he "breathes the same air, and is nourished by the same food." An exhibition of sympathy may be all very well; but as

for the other points—well the consumer must be blind, physically and mentally, if they are not obvious without any special essay at making him feel them. However, "to soothe the unhappy, and to bind up the wounds of the painful kicker, is the manager's especial province." Whether the unhappiness and the wounds of the painful kicker come from the manager making the consumer feel that he is human, that he breathes the same air, and is nourished by the same food, is not explained. Yet it can hardly be, because later Mr. Decker advises managers to always practise a kindly manner towards an irate customer, to retain his self-control, and to remember that before one can expect to control others, he must first learn to control himself. That is true, and so is this: "The public is prone to judge an institution by and through its employees, and praise or blame is directly due to the manner in which the consumer is treated. Courtesy is a cheap investment, which results in big dividends. Failure to keep a promise made, forgetting or neglecting a request, will result in shaking the faith of the public in your desire to please, and confidence once destroyed is not easily restored." The gas manager who is up to the standard laid down by Mr. Decker would be of an angelic disposition; but it is equally true that the nearer a gas manager approaches that standard, the better is it for the undertaking whose interests he has to defend and cultivate. To a European reader, the paper seems to be a curious concoction of wit and wisdom; but we suppose every word and line in it ought to be read seriously.

The Charges against a Glasgow Gas Official.

Of the making of charges against gas managers there would seem to be no end. The latest process of investigation has been instituted against Mr. John Wilson, the Manager of the Tradeston Gas-Works in Glasgow. Who would have ever expected that in Glasgow—where the department was watched by the lynx eyes of the late Mr. Foulis—anything could have taken place which would have required the intervention of the Gas Committee? and who would have suspected that Mr. John Wilson's actions should have been the subject of inquiry? But so it is. It was a private member of the Corporation who brought the matter forward, which rather points to what is described as "irregularities" having been so small as to have been unworthy the attention of the officials, or to their having been laid before the councillors by some interested parties. It is one of the features of present-day municipal life that there is ready soil in the minds of certain members in nearly all corporations for the sowing of dissension between the community and the holders of official posts. In some cases the discord introduced is between the official and the employees under him. This is an element that is not unconnected with the extensive practice of municipal trading which now prevails; and it is one which is not likely to lessen as that practice develops. A perusal of the report of the Sub-Committee who have been considering the charges against Mr. Wilson for nearly all this year, does not reveal anything done by him by which the Corporation or the undertaking could have suffered greatly. All that the Committee have found are a few small items which certainly it would have been better had they not been there to discover, but which are not, on their merits, worth the expenditure of so much time or energy as have been bestowed upon them. It is not, however, upon their merits that they become important; it is on principle that they must be judged. And when we consider the circumstances as they exist—the jealous workman, the councillor with the ready ear, and the public who love a scandal, it cannot be too closely brought home to all that in such matters as those with which Mr. Wilson stands charged there is no give and take. Only one course is safe; that is not to give anyone the opportunity to say that something has been done which should not have been. Everyone will be sorry for Mr. Wilson, and that the Sub-Committee have seen fit to take so serious a view of the matter. It is to be hoped the Corporation, when the report comes before them to-morrow, will look more leniently upon it.

The Credit of Municipalities.

The current number of "The World's Work" contains an article in which Mr. J. E. Woolacott asks the question: "Is municipal credit good?" and promptly proceeds to answer it, to his own satisfaction, in the affirmative. Perhaps, however, it is hardly correct to say "promptly," for before condescending to argument he pauses to roundly abuse those who have, in the carrying out of what they regard as their duty, felt it incumbent on them to take a different view of the matter to that which he adopts. "There are," he says, "among us a number of writers who apparently consider it 'dashing' to throw mud at municipalities. Their qualifications to handle financial questions are often conspicuously absent." On catching sight of these last words, we thought that Mr. Woolacott must be meaning them to apply to the municipalities, and that probably he had the case of Dublin in mind. The phrase which follows, however, precludes such an interpretation; and we are therefore driven to think that it must be the knowledge of some weak point in his own case which causes him thus to "bully" the other side. But whatever may be the truth in this regard, it might be quite possible to grant Mr. Woolacott his contention that the difficulties which corporations are now experiencing in issuing loans are solely due to the glut of high-class securities on the market, without in the slightest degree admitting the wisdom of the huge capital expenditure that local governing bodies have of late years been so light-heartedly incurring. It is very clear that the "Progressive" element in public life is beginning to feel decidedly uncomfortable, and—its supporters are consequently getting very angry. But this will not mend the matter. No amount of railing at opponents will enable (say) a scheme that looked attractive when capital could be obtained at about $2\frac{3}{4}$ per cent. to appear equally pleasing now that nearer $3\frac{1}{2}$ per cent. has to be paid for the loan. Hence the present period of dear money may be expected to kill—or at least to shelve for a considerable time—many municipal proposals for capital expenditure; and it is for this small mercy that so many people are devoutly thankful. Mr. Woolacott is horror stricken at the mere suggestion of municipal extravagance; and he says it is a mistake to suppose that rates are far higher in boroughs which have engaged largely in municipal trading than in others that have shown themselves more conservative. It should be possible to find a better argument than this in favour of his opinion—that is, if his view is really the sound one?

The Reproductive Undertakings Return.

Of course, no discussion of the municipal trading problem would be complete without some reference to the parliamentary return issued a few months ago with regard to the "Reproductive Undertakings of English Municipal Corporations;" and so Mr. Woolacott quotes from it figures indicating the capital position and the average annual profit and loss between Jan. 1, 1898, and March 31, 1902. The result is to show a net profit of £378,281 per annum on an outstanding capital of over £100,000,000! We have already seen these figures quoted with great satisfaction by no less a supporter of Municipalism than Sir Albert Rollit, M.P.; and all that need be said is that anyone who is proud of them would be proud of anything. They may not afford any support "to the reckless charges that have been hurled against the corporations as a whole;" but, on the other hand, they surely cannot fairly be said to offer any substantial assistance to the cause that Mr. Woolacott has at heart. Indeed, we cordially agree with him that the return "is undoubtedly of great value to all who are endeavouring to arrive at a right decision on the question of municipal trading." Bearing in mind the enormous risks involved in such a gigantic capital expenditure as that named, those who carefully study the figures in all their bearings will almost certainly feel impelled to confess that "the game is not worth the candle"—even apart from any questions of principle involved. Then, again, it is impossible to find fault with Mr. Woolacott's assertion that "it would be well if this problem were always approached with a due sense of the obligations of the community to those who perform municipal work." But we would, with due humility, venture to suggest that there is at least an equal duty cast upon the said "performers," to remember their obligations to those who elect them as their representatives. We do not say that councillors as a rule need to be reminded of their duty in this respect; but it must also be denied that there is any general tendency on the part of ratepayers to forget what is due to those who undertake the public work of their town.

The Other Side.

Presumably, however, we are among those whose "qualifications to handle financial questions are conspicuously absent." It must be so; for, along with the "Pall Mall Gazette" (we have good companions in our ignorance), we are puzzled with the financial record of the Islington municipal electric light undertaking. From a report issued by the Borough Accountant, it appears that, for the twelve months ending March last, there was a deficit of £1740; the working expenses for the year having risen from 2·71d. to 2·97d. per unit—the increase under the head of repairs alone more than representing the loss on the year. Our contemporary remarks that a further examination of the figures reveals the fact that, during the eight years of its adoption, the electric light system of the borough has shown the "strangest fluctuations." The loss on revenue at the end of March, 1895, was £336; nine months later there was a further loss of £995; while for the year ending December, 1896, there was a loss of £1836. In the following twelve months, however, the working resulted in a debit balance of only £318, which a year later was turned into a profit of £2206; but this dwindled in 1899 to £380. In 1900, there was again a loss of £3117; but the position was once more reversed in the five months from November to March, 1901, when a profit was made of £2089. In 1902, the profit was £1402, which has this year been changed into a heavy deficit. We should like to ask Mr. Woolacott what would be thought of a board of directors who conducted a purely commercial undertaking on these lines. And he might at the same time favour us with his opinion on the financial vagaries of the Corporation of Dublin, the Local Government Board Auditor's animadversions on which were referred to in the "JOURNAL" last week. As an argument, a few cases of the kind quoted are worth a very great deal of socialistic theory.

The Physique of the Working Classes.

In an article which appeared in our "Essays" columns last week, reference was incidentally made to the allegations regarding the physical deterioration of the working class. Last Saturday the announcement was made that the Lord President of the Council has appointed a Committee to make a preliminary inquiry into the subject. This appointment is the result of official reports. The Royal Commission on Physical Training in Scotland, after an exhaustive investigation, found that there was an undeniable degeneration of individuals of the class where food and environment were defective; and in his report for 1902, the Inspector-General of Recruiting said: "The one subject which causes anxiety in the future as regards recruiting is the gradual deterioration of the physique of the working-classes, from which the bulk of the recruits must always be drawn." With these facts before him, the Earl of Meath, on July 6, in the House of Lords, asked the Government whether they would appoint a Commission to ascertain whether the poorer population in our large towns were exposed to conditions likely to contribute to a low national standard of physical health and strength. Hence the Committee.

The Garden City Project.

It seems that the scheme for the erection of a "Garden City," which has for a long time been vigorously advocated by Mr. E. Howard, has at last taken practical shape, and that a site of about 4000 acres near Hitchin has been secured for the purpose. The estate is about 34 miles from London, and is said to be well situated for establishing a residential and manufacturing town. The land has been secured at a very reasonable price, and no difficulty is anticipated by the promoters in carrying out a successful commercial enterprise, without departing from the principles of the movement. For this purpose, a Company with a large capital will shortly be formed; and it is intended to pay a cumulative dividend, limited to 5 per cent. per annum, to the shareholders—the balance of the profit to be used for the benefit of the town and its inhabitants. No doubt the movement will be followed with great interest by those who are striving to better the conditions of life of the working classes; and in all probability some further light will be thrown upon the intentions of the promoters of the scheme at a public conference which it is intended to hold on the site of the town early next month. If this idea of the sudden building up of entirely new cities should be adopted to any large extent, it will open up questions of the greatest importance in very many quarters.

WATER AFFAIRS.

Trouble with the Croton Dam.

THE danger attending the placing of large construction works in the hands of one man, without the assistance of a consultant, has been well exemplified in the case of the dam which is being built across the Croton River, about three miles from the Hudson, in extension of the waterworks for the supply of New York. It is the tallest masonry dam in the world, and will impound an additional supply of about 30,000 million gallons of water. It is being carried out by a Board of Commissioners. Work upon it was commenced about eleven years ago; and Oct. 1, 1904, was the date fixed for its completion. It would probably have been finished before this date had it not been for changes which have been ordered while it has been under construction; and according to a report the Commissioners have lately presented (which is in the nature of an answer to certain charges of neglect of duty brought against them by the Merchants' Association of New York, and now under investigation), neither the dam nor the reservoir in Jerome Park in connection with it will be ready in anything like the time specified. This is not all. It seems that before these works can be completed an additional expenditure to the amount of $6,418,056, or about £1,283,000, will have to be incurred. The Commissioners say the delays which have taken place in the progress of the work have been the result of unforeseen physical conditions and labour troubles—the latter having been acute since early in April.

The original designer of the dam was Mr. Alphonse Fteley, whose death was announced in our columns a few weeks ago. He supervised the work in its early stages, and then resigned his position as Chief Engineer to the Commissioners, being succeeded by Mr. W. R. Hill, who has followed a similar course. Before doing so, he reported a very unsatisfactory condition of affairs at the dam. Disintegrated limestone was discovered under the wall, and although excavation has been going on since March, no solid foundation has yet been reached. The meaning of this is that at nearly 200 feet from the surface no solid rock has yet been found; and Mr. Hill cannot tell when it will be. At the Jerome Park reservoir, it was lately reported that the western wall is unsound; but no allusion is made to this matter by Mr. Hill. What he does say, in regard to the serious charges which have been brought against the Commissioners, leads to the conclusion that he has been single-handed in carrying out these large works. After an investigation was made into them by a Board of expert engineers, he was taken ill, and was absent for about six months. This was an unfortunate occurrence, but it would have been attended by less serious consequences had Mr. Hill been allowed, as his predecessors were, the assistance of a consulting engineer. This, however, was denied him; and he had to bear the entire responsibility. In a work of such magnitude, this surely was too much to place upon him; and if the present unsatisfactory condition of the works is in any way to be attributed to the action of the Commissioners, the Merchants' Association have earned the thanks of the citizens by causing their conduct to be investigated.

The marriage was solemnized at Lancaster, on the 2nd inst., of Mr. William Thomson, Gas and Water Engineer to the Kendal Corporation, and formerly of Paisley and Inverness, and Miss Eleanor Henrietta Armitage, elder daughter of the Engineer and Manager of the Lancaster Corporation Gas-Works. Among the presents received was a handsome marble clock and ornaments from the employees at the Lancaster Gas-Works. On a silver-gilt plate on the timepiece was the following inscription: "Presented to Miss Armitage on the occasion of her marriage to Wm. Thomson, Esq., by the employees of the Lancaster Corporation Gas-Works. Sept. 2, 1903."

In conformity with the custom of many years past, the representatives of the Richmond Gas Stove and Meter Company, Ltd., had a conference on Friday—the gathering on this occasion being at the London offices and show-rooms in Queen Victoria Street. The same evening a dinner was given to the representatives by the Managing-Directors of the Company. A pleasing feature of this event was the presentation, by the officials and representatives, of a wedding gift to Mr. George Mills, who is the representative of the Company for Scotland and the North of England. The present took the form of a pair of very handsome Parisian vases.

ESSAYS AND REVIEWS.

GAS HEATING ON THE SLOT SYSTEM.

THERE are managers of gas undertakings who have tried almost every agency or means that has been suggested for extending the consumption of gas for cooking and heating, and are now looking out for something new, to help to give a fillip to the accretion of business. Exhibitions have been held; but people have grown particular as to the exhibitions they attend. Many residents in the majority of towns have wasted evenings before; and unless the exhibitions are now on a worthy and attractive scale, they will not look at them, and so they are of little value. In fact, if exhibitions are not done thoroughly, they might just as well be left alone for the real good that they will effect. Canvassing has been tried by most managers; but, in small towns, one cannot be everlastingly canvassing. The residents would soon, after the first one or two calls, unless a good interval of time elapsed, tire, and many might even have something rude to say to the persistent and dogged canvasser. There is the circular sent out with the accounts and the backs of accounts themselves; but these unfortunately only reach the people who are already consumers, and many of whom are supplied with cookers and perhaps gas-fires. The method of general advertising in the local press has not been taken up perhaps so largely as it might have been, nor has the method of circularizing throughout districts, in order to reach those who are not already consumers. The lady inspectress or canvasser, who is able to give instruction in a diplomatic and inoffensive way, and at times carry away new orders, has not become a flourishing institution in this country. This particular suggestion was made in the "Daily Telegraph" early in December last, and was referred to in the "JOURNAL" on the 9th of that month. In his article in last week's issue, Mr. C. E. Jones suggests it as "a new departure," and predicts that the investment would be a good one. We believe that the Croydon Gas Company have got as near as any gas undertaking in this direction; they having an accomplished lady constantly on their stove department staff. Next there is the use that may be made of the local shareholder as proposed in a leading article in last week's issue.

Our own opinion is that all these various methods of gaining new and of conserving the old business may in turn be found fairly useful, and should from time to time be brought into service. But it was suggested to us the other day, by a gentleman who takes a great interest in these matters, that gas undertakings are giving too much attention to the cooking-stove nowadays, and not sufficient to other branches of the domestic business. The cooking-stove, he says, is—like the prepayment meter business—quite capable of taking care of itself, and is so spontaneous in development that special effort does not produce enough over and above the normal rate of increase to pay for the effort. He instanced a case in which a special canvass of a district had been made by a firm of manufacturers on behalf of a gas undertaking, and the resulting profit from the immediate increase of orders for cookers was not sufficient to recoup the expense incurred in making the canvass. Of course, this may be so; but the immediate return from the canvass may be no criterion of the ultimate advantage that may spring from it directly, if not in space of time, as a result. There are several influences that may render a canvass for any one particular department of the gas business unprofitable, the chief of which influences would, of course, be the frequency of similar or other special efforts to obtain orders. Besides, success or otherwise would depend on the amount of life the management of the gas undertaking had previously thrown into the work.

But there it is. This is the deliberate opinion of a man whose interests are centred in the sale of gas, that the business in gas-cookers is now so hardy that its growth is perennial; and therefore, for a time, the energies of gas undertakings should now be specially bent upon the strengthening of their weaklings. He names the gas-fire business as the most invertebrate. Insufficient attention, he thinks, is given to this branch—why, he cannot conceive; and, moreover, little inducement is held out to stove manufacturers to produce new types. It does not pay, he argues, to go to all the expense attaching to the turning out of new patterns, and then perhaps throughout a whole season only half-a-dozen or so of the fires are sold. This, however, is apart from the main question. The winter is coming; and he urges that special canvassing should at once be taken in hand to secure custom for gas-fires, and let the cookers have a rest. He goes further, and suggests that the gas-fire business is one which might well be developed by gas undertakings on the same line as the prepayment system. The great obstacle to the proposal appears to us to be the expense. Gas-fires in several rooms of a house, with a prepayment meter attached, would mean a considerable capital outlay—more, of course, than an ordinary installation under the prepayment system would cost; and it is questionable whether gas undertakings could afford to give sufficient gas for a penny (or other coin) to pay themselves and make the scheme attractive to the householder. In addition to this, for six months and more in the year, the capital would be lying absolutely idle. However, the idea is one that may well be worth looking into. Anyway, if even on the first blush it does not strike one as having any great profit in it, it may be made productive (if not generally) in houses where the expense of luxury and convenience is not considered twice if it can be obtained by easy payments, and yet where the first cost of installation would make the householders close up tightly against the idea. This is the suggestion in rough form. It may have been tried somewhere; if so, we should be glad to hear of it, and of the results. The idea, too, may suggest to someone an expansion or modification, or a settled line of action in working up a gas-fire connection on the prepayment system. If so, readers would be pleased to make its acquaintance. Of course, it would be a simple plan to offer the supply of a prepayment meter free in the case of consumers who hired or purchased stoves according to the custom in this respect of the gas undertaking concerned. This would, in large measure, overcome the capital difficulty.

Of this we are convinced, that there is a large fallow field lying before gas heating in dwelling-houses. Householders are not generally and sufficiently aware of the comfort that may be theirs, without care or labour, in every room of a house at a moderate expense; and a special effort such as our manufacturing friend has introduced to notice, or something akin to it, may not be labour lost in many places just now. The time for some form of endeavour will in two or three weeks be very seasonable.

DOMESTIC AND OTHER INTERIOR LIGHTING.

IN the last issue of the "Ironmonger," there appears an article dealing with the important question of interior lighting. The information is given that the author is "an occasional contributor, who is an acknowledged authority on artificial lighting;" and what he has written certainly discloses an intelligent study of the subject and appreciation of the principles that tend to efficiency in house lighting. In the main, therefore, the article is composed of accepted truths; and on only one point is there any necessity to join issue with the writer, and even there the question between us is only one of degree. On that particular point, however, we will animadvert presently.

In the first part of the article, the writer attacks—as has recently been done in the "JOURNAL"—the remarkable statements that have been made by non-technical persons about the relative cost of developing artificial light. The statement which aroused criticism in this case was that of a correspondent in a contemporary to the effect that he had lighted his business premises for three successive seasons by means of coal gas, electricity, and acetylene, with this result: In 1899, his bill for coal gas, at 3s. per 1000 cubic feet, came to £8 18s. 8d.; in 1900, for electricity, at 6½d. per unit, to £16 10s.; and in 1901, for acetylene, to £8 16s. It was claimed that for these payments twice as much light was obtained from acetylene as from electricity, and three times as much light from acetylene as from coal gas. The contributor in the "Ironmonger" very rightly shows that, if these ratios for the light are correct, then the costs must be wrong; but as the costs, being actual payments, may be relied upon, then a large error has been made in estimating the ratios of light obtained. Further, it is obvious that the consumer who has proffered this extraordinary contribution to the subject of the comparative cost of artificial lighting has been using both his gas and electricity in a wasteful and inefficient manner. The question being one which is very much alive at the moment, the calculations which the writer in our contemporary has made to disprove this example of a very common error, will be of interest. Although described as "an occasional contributor," the writer, it will be observed, adopts the editorial "we." However, he says:

> We may assume that the cost of the acetylene omits all reference to interest and depreciation on plant, covering only the cost of the carbide. It follows, therefore, that if the carbide cost £20 per ton, 4928 cubic feet of acetylene must have been generated. Supposing the yield of gas to have been 5 feet per pound, and 0·7 foot burners giving 27-candle power each, or 38·5-candle power per foot, to have been used, £8 16s. worth of acetylene should have evolved 189,728-candle power. Since the relative amounts of illumination said to have been developed stand in the ratio of 2 for coal gas, 3 for electricity, and 6 for acetylene, we find that the total candle powers evolved are, in round numbers, 63,000 with coal gas, 95,000 with electric current, and 190,000 with acetylene. Correcting these for equivalent illumination on the writer's estimate, we find that coal gas lighting should have cost £26 16s., electric light £33, and acetylene £8 16s.; or that coal gas should have cost about three times, and electricity nearly four times, as much as acetylene. Now to see what the correspondent of our contemporary has been doing, we may calculate that he consumed 59,556 cubic feet of coal gas, and obtained 1·06 candles per foot—with good self-luminous burners he ought to have obtained 2·5 candles per foot, or 149,000-candle power altogether; with incandescent burners he might have obtained 15 candles per cubic foot, or 893,000-candle power altogether. Of electricity he consumed 610 units, and got 156-candle power per unit, instead of (at the conventional estimate) 256-candle power per unit, or 156,000-candle power altogether. Thus he implicitly admits that he developed little more than half the light from his electric current that he ought to have done, and that he obtained only two-fifths of the possible light from his coal gas in luminous burners, or one-fifteenth what he might have obtained in incandescent burners. And still accepting his estimate of illuminating power, he ought to have burnt 76,000 feet of coal gas in flat-flame burners at a cost of £11 8s.,

or 12,680 feet in incandescent burners costing £1 18s.; or to have consumed 744 units of electricity at a cost of £20 3s. to obtain illumination equal to his £8 16s. worth of calcium carbide. We shall not be far wrong if we admit that the writer did obtain much less light from his coal gas and his current than he ought to have. In the former case he probably used old, dirty, worn-out flat-flame burners, exposed to draughts, or surrounded with dirty glassware, possibly of bad design and shape. In the case of electricity, he may have employed inefficient glow lamps, and retained them in service long after they had reached "smashing-point."

To say the least, these calculations exhibit, in a truly luminous manner, the fact that this erring consumer might have obtained by incandescent gas-burners as much illumination as by his acetylene burners at an insignificant outlay compared with either acetylene or electricity. But, as is pointed out, the chief fallacy lies in the statement of the consumer as to the illumination developed. In other words, he has made the usual mistake of confusing illuminating power and illuminating effect—the simple explanation being that the light developed from the acetylene was more usefully employed by a more judicious distribution of the sources of light than, at any rate, in the case of gas. On this point of illuminating effect, the writer in the "Ironmonger" enlarges; and, in doing so, he advocates, to obtain the most useful illumination in a room, the distribution in it of small units of light rather than one large centre of light of (say) 64-candle power. But this is where he goes to the extreme. The multiplication to a reasonable extent of the points of lighting in a room is an accepted law in the realization of efficient and useful lighting (apart from all question of cheapness); but to lower these points to the minimum of lighting power largely reduces, in our opinion, both efficiency and effect. The writer argues:

> Extinguish the single 64-candle power light, and dot about the room some fifteen or twenty single candles, although we should have only one-quarter or one-third of the light that we had before—*i.e.*, only that fraction of the original illuminating power—we should have far better illuminating effect, and we could practically do or see anything anywhere. The explanation is obvious. With our twenty candles, every object in the room would cast twenty shadows in place of one, and the spot occupied by each shadow would still be illuminated by the light from nineteen candles, so that it would be invisible; while, if the light from any one candle were reflected from an object into our eyes, the reflected beam would be much too weak to be annoying or harmful. Again, if, in moving about our eyes, encountered the direct rays from a single candle, we should not be appreciably inconvenienced; but if we looked straight into the 64-candle power light for a time, we should be rendered partially blind.

Again, on this same point, later in the article, he suggests that the best burners to adopt in a room are those having the size and efficiency of the No. 1 Kern; all sizes larger than this being too powerful to obtain the best illuminating effect. But in the rooms of a house, it is not only æsthetic effect that is required, but that effect combined with usefulness; and, besides, we must not be altogether unmindful of the economical aspect of the question. These small sources do not compare in efficiency with larger units when the illuminating power is considered in relation to the consumption; and their installation and upkeep, in the total, is far more expensive. But the great point is that, unless the very small units are multiplied to an inordinate extent, it is quite impossible to carry on the ordinary occupations of the home-circle with any degree of comfort. While one does not wish to be blinded by an excessive amount of light from a single source, neither does one wish to be so devoted to æstheticism or effect as to be unable to read, write, or sew in a room without sacrificing the eyes by straining them. The one is just as bad as the other.

We have before us now the case of a drawing-room in a house in the suburbs, which a short time since was redecorated, and at the same time fitted with electric incandescent lamps—a centre one reputed to be of 32-candle power, and half-a-dozen 8-candle power lamps disposed round three sides of the room. The walls and ceiling were all that could be desired as aids in the distribution of the light. But, nevertheless, the resulting "dim religious light," while appropriate perhaps to meditation, was an effective bar to the enjoyment of music (without the aid of candles) or to reading unless the reader seated himself immediately under the so-called 32-candle power light. Now in this drawing-room there is to be seen the incongruity of a Welsbach "C" burner in the centre, and round the sides the 8-candle power electric lights. But, whereas the room for usefulness is now efficiently lighted, it was not so when it was given over entirely to the low units of electric lighting. The effect, too, would be greatly enhanced if small incandescent gas-lamps took the place of the 8-candle power electrical decorations (for they are nothing more) round the walls of the room. While, then, agreeing in principle with the writer in the "Ironmonger," we cannot go with him to the extreme moderation of the units of light which he advocates. If burners of a size or two larger than Kern No. 1 are employed, the user has always the tap at command to regulate the light to his requirements for the time being—wherever may be his or her situation in the room, and whatever the occupation.

There is much in the article, in addition to the points noticed, with which readers of the "JOURNAL" are in common agreement with the writer; and from this remark it will be taken that those other points are of general knowledge. Elaborating, however, the practical lessons which follow from his argumentative contribution to the general subject of lighting, the writer observes:

> Except when the prime cost of the installation can be almost entirely ignored, paraffin lamps are in many respects the best source whence to obtain good illuminating effect, because they can be moved about from time to time into positions where they yield light to the best advantage. On the other hand, they have numerous practical defects too well known to need mention; and they are much less hygienic and economical to use than coal gas, provided the latter is employed properly. In all but the smallest villages of this country where coal gas is supplied, it is sold at a price which makes it the cheapest illuminant of all if incandescent burners are used efficiently. In fact, the price at which coal gas is sold bears little or no relationship to the cost of the light which is developed from it by the average private consumer; and therefore it is always necessary to explain to such a person, with as much plainness as is possible, when he complains that his rooms are "gassy" of an evening, or that his gas bills are intolerable (we are talking of gas as a source of light only) that the fault is his own for wasting the latent illuminating power supplied him. Economy in the consumption of gas, not merely for pecuniary reasons but for hygienic reasons, is far more necessary in small towns than in large, in the Provinces than in London, because the "gassiness" of a room, and the headache, &c., it gives rise to, is due to the collection in the room of the combustion products of the impurities in the gas, which impurities are most marked in quantity in small towns. It is, therefore, to the interest of the consumer, and more especially of the country consumer, that he shall be persuaded to adopt incandescent lighting.

The only point in these conclusions which might be challenged by many gas suppliers is that as to the greater amount of "impurities" in the gas supplied in the Provinces and in small towns compared with London. But that need not be enlarged upon here—the feature of the article being the further testimony it affords as to the pre-eminence of the incandescent gas-burner in artificial lighting. It is a pleasure to see such testimony being disseminated, by their chief organ, among traders who deal so largely in lighting appliances for private use.

NATURAL GAS LITERATURE.

LAST month, when noticing an article on the subject appearing in "Cassier's Magazine," we took occasion to remark that there had been ample opportunity of acquiring, through the medium of the Press, information with regard to the aspirations and realizations of those connected with the "Natural Gas Fields of England, Limited." Still further facilities in this direction have since been placed at the disposal of the general public, and of persons more particularly interested in the matter; and we have before us at the present moment no less than three contributions to the literature of the subject, of subsequent date to the article in the August number of "Cassier's Magazine." The first of these consists of some notes by Mr. H. B. Woodward, F.R.S., which appeared in the "Iron and Coal Trades Review;" the second is a paper which was read at the Nottingham meeting of the Institution of Mining Engineers, by Mr. R. Pearson, on the 2nd inst.; while the third takes the form of an interview which a representative of the "Manchester Guardian" has had with Mr. Inverness Watts, the Engineer to the Company. Of course, these communications detail the interesting circumstances under which the existence of natural gas in Sussex first made itself known; but with these "JOURNAL" readers (and by this time possibly most other people also) are quite familiar. The vital question is the extent of the supply; for there must be a practically assured prospect held out of a long continuance of the flow of the gas before a beginning is made with the industrial revolution which it is prophesied is to take place in this part of the country. It is therefore to this aspect of the matter that we shall chiefly devote our attention on the present occasion—feeling sure that in this way will the best interests of everybody be served. Let us therefore see what is the nature of the reasons advanced in favour of the opinion that large quantities of the gas exist in the region covered by the operations of the Company.

Mr. Woodward's qualifications are such that great weight must attach to his statements; and in his notes (which are an abstract from the Memoirs of the Geological Survey) he says the information available indicates that a certain amount of natural gas is pent up in the Lower Wealden beds and the Purbeck beds. The six boreholes which have so far been put down have not, however, penetrated any thick masses of porous strata, such as might be judged capable of storing a vast accumulation of gas. What has been obtained must have been stored in comparatively thin layers of sandstone and sand interlaminated with the Wealden clays, and in the harder bands of the Purbeck. It appears to him, therefore, that gas is derived from the Purbeck shales, and that it may be stored over a considerable area in the thin porous beds. Mr. Woodward quotes a table from Dixon's "Geology of Sussex" as evidence of the fact that below the Purbeck beds (400 feet) there are important beds of sand and sandstone, from 50 to 60 feet in thickness, which are capable of storing a great quantity of gas; and he adds: "At present these strata have not been penetrated in any of the boreholes in search of natural gas; and it would seem necessary to bore from 300 to 320 feet deeper at Heathfield to reach this horizon. It is possible, however, that gas from these beds may have been indirectly tapped through crevices and fault-planes; but on this point nothing definite can be said. The absence of water from the

strata may be due to the presence of the gas; and water may replace it as it escapes." Unfortunately, the borings put down by the Company have been made by means of a "jumper," and so the material has been brought up in the form of sludge, which has rendered it impossible to ascertain with anything like precision and record the details of the strata passed through. It would seem that the best possible thing for the Company to do will be to hasten on with the sinking of some (or all) of their bores to the further depth of 300 feet mentioned by Mr. Woodward as being necessary to reach the beds of sand and sandstone which are "capable of storing a vast quantity of gas." At any rate, that is our reading of Mr. Woodward's notes. No doubt, the promoters of the undertaking will see the matter in the same light, for they are naturally anxious to put an end, as far as in them lies, to any uncertainty with regard to the duration of the supply of the commodity which the Company was formed to exploit.

In his paper, Mr. Pearson explains that the six boreholes the positions of which he located were started in the Hastings sands, which are composed principally of sandstones and iron-bands, marls, &c., and so form a cap admirably adapted to act as a natural holder for gas. Heathfield is built on the well-known Mid-Sussex anticlinal; and the Sub-Wealden Exploration boring, started in 1873 in the Purbeck beds, some 9 miles east, is on the same anticlinal. This fact, Mr. Pearson remarks, proves conclusively the relative identity of the two discoveries. During the Sub-Wealden boring operations, the presence of inflammable gas was reported; and it was attributed to the petroleum-bearing Kimeridge clay. The Purbeck, the author says, is well known to have bituminous beds throughout its whole course; while the Kimeridge clay, lying about 200 feet below the Purbeck beds, has been proved to be the thickest bed of the clay in England. About 250 feet of this bed is of a very bituminous character; and the Oxford clay below it is also known to be bituminous.

Mr. Pearson states that, in searching for natural gas in the United States, three points are principally held in view. These are as follows: (1) Have the rocks been disturbed? If so, no further time need be wasted looking for gas. (2) Is it an anticlinal formation? (3) Are there any known bituminous beds below? Applying these questions to the part of Sussex in which operations are being carried on, his answers are: (1) The iron-formation of the Hastings sands is practically not disturbed at all. (2) It is well known to geologists that the North and South Downs are simply the outlyers of an enormous anticlinal. (3) There are three successive bituminous beds proved to lie immediately under the sandstones. There is thus, he argues, every probability of the existence of a large as well as lasting rich natural gas field.

At Mayfield, which is about 5 miles from Heathfield, boring has been commenced in two positions on the Hastings sands. In one of these boreholes, gas has already been struck; while in the other, at a depth of 300 feet, a stratum 20 feet thick affords a fair yield of petroleum. Borings are now being made over some 200 square miles in Sussex; and the author says he hopes "soon to prove" large supplies of gas throughout this territory. In anticipation of this satisfactory outcome of the prospecting operations, "facilities have been afforded by the London, Brighton, and South Coast Railway Company for laying conduit-pipes along their lines to supply the gas-works of large towns in the vicinity."

With regard to the composition of the Heathfield natural gas, and the purposes for which it is more particularly suitable, Mr. Pearson says that the Sussex gas, in its original state, gives, in an ordinary argand burner, a light of about 12 candles; and though this illuminating power is not altogether a unique feature (it having been equalled by some of the gas discovered in the United States), the majority of the natural gas-fields of America yield a gas which gives but a poor light when used in ordinary burners. This high illuminating power of the Heathfield gas is accounted for by the following analysis (which has already been given in the "JOURNAL") by Professor Harold B. Dixon: Methane, 93·4 per cent.; ethane, 3 per cent.; nitrogen, 2·7 per cent.; and carbonic oxide, 0·9 per cent. It is the 3 per cent. of ethane which gives the Sussex gas its conspicuous superiority as an illuminant over most of the natural gas found in America. The great point in the future of Heathfield gas will, however, Mr. Pearson contends, "be its value as used to provide machine power. The engines in use at Heathfield consume about 13 to 15 cubic feet of natural gas, as against 20 to 25 cubic feet of coal gas. These figures are sufficient indication of the enormous saving that may be effected. The heating power that can be obtained from a gas containing 93 per cent. of methane need not be mentioned to anyone who has ever interested himself in gas world matters; and natural gas of the Heathfield quality easily stands in front of all other kinds of fuel." There are at the present time some 11,000 gas-wells in the United States; and, in the author's opinion, though there are now only nine in Sussex, and ten others in course of sinking, there is sufficient gas-bearing land there to warrant the putting down of "many thousands of wells," and he "can only assert that thousands of wells will be sunk."

The paper (which is accompanied by illustrations of the various boreholes of the Natural Gas Fields of England, Limited) concludes with the following comparison of the approximate heating power in British thermal units of various gaseous fuels per 1000 cubic feet, at 40° Fahr. and atmospheric pressure: Sussex natural gas, 1,100,000; coal gas, 735,000; water gas, 322,000; and producer gas (heated), 156,000. The volume of gas in cubic feet used to produce 1-horse power in any well-known make of gas-engine is given as: Sussex natural gas, 12 to 15; coal gas, 20 to 25; water gas, 60 to 80; and producer gas, 100 to 120.

The account of the interview which the representative of the "Manchester Guardian" had with Mr. Inverness Watts is, of course, written in a popular rather than a technical strain; but it contains some interesting particulars of the way in which the Company propose to utilize the gas which they have, or hope in the future to have, at command. The proved area of the gas-field is said to be about 9 miles long and 5 miles wide; and from one of the existing borings the Company can take 6 million cubic feet a day. Asked what they intended to do with the gas, Mr. Watts pointed out that Heathfield is at present taking a supply; but he said the promoters, of course, had their eyes upon the big towns that lie within easy reach—Eastbourne, Brighton, Hastings, Bexhill, and Tunbridge Wells, all of which are within a radius of about 20 miles. The matter, he said, is now being discussed with Brighton and Eastbourne; and the basis on which the Company are negotiating is that they should receive 2d. per 1000 cubic feet less than it would cost the towns in question to manufacture gas for themselves. For places at a greater distance, the idea is not to send out gas but electricity. "We can," remarked Mr. Watts, "generate electricity for next to nothing. Take the case of Newcastle, which has the cheapest supply in the country. It costs them to generate electricity 0·35d. per unit, of which 0·16d. is for fuel. Half the cost is for fuel; and we get our fuel for nothing. London is only 47 miles away; and in time we could send to London all the electricity it needs." The freehold of 300 acres round Heathfield Station has been acquired by the Company; and portions of the land they propose to let for the building of works, to which they will supply both light and power. Applications for land have been received from a number of firms; but no definite arrangements have yet been made. The Company have also secured mineral rights over an area of about 300 square miles; on the basis, the interviewer believes, of a royalty of 12½ per cent. on the average selling price of the gas.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 626.)

THE Stock Exchange is still feeling the effects of the holiday season; while the few bright days during the early part of last week further reduced the attendance. In spite of the small volume of business, a good tone prevailed until the advance in the Bank rate to 4 per cent. was announced on Thursday. Though dearer money was expected during September, the rise so early in the month completely took the House by surprise, and naturally caused prices to give way, including high-class stocks. Consols—which had recovered to 90⅞—in view of the October dividend being taken off the price, fell sharply to 89½ *ex* dividend, but subsequently recovered to 89 13/16. The monetary outlook and the continued demand for gold for the Continent is such that no ease in discount rates can be expected for some time; and it would cause no surprise if a further decline in Consols took place before the end of the year. The Gas Market has not been affected by dearer money, and values have been well maintained. Gaslight and Coke ordinary have improved 2, to 87-89; while the other Metropolitan gas stocks have been well maintained at last week's prices. Dealings on the rebate were on a moderate scale; the most activity being in Gas ordinary. South Metropolitan changed hands between 121½ and 120½. In the Suburban and Provincial group, the feature was the demand for Newcastle and Gateshead, which rose 3½, to 102½-103½; while the debenture stock receded ½, to 99-100. There was some dealing in Crystal Palace at 114, and in Brighton and Hove ordinary between 213 and 215. The only movements in the shares of foreign companies were a rise of ¼ in Bombay, to 5½-6, and a similar gain in River Plate, to 11-11½. Continental was quiet, with few dealings recorded. There was renewed weakness in Water stocks; the chief fall being 4½ in West Middlesex, to 273-278. Lambeth 10 per cent. maximum lost 3½; while in the secured issues East London debenture stock fell 1, Southwark and Vauxhall 5 per cent. preference 3, and West Middlesex debentures ½.

The daily operations were: Quiet business in Gas on Monday. Water stocks were likewise steady. No changes were recorded on Tuesday, except in Tarapaca Water, which rose ¼, to 10-10½. On Wednesday, there was a little more doing in Gaslight and Coke, which rose 1 to 86-88. Water stocks were quiet. Thursday saw a further advance in Gaslight and Coke, to 87-89, and ¼ rise in River Plate Gas, to 11-11½. Water stocks were offered; West Middlesex falling 4½, Lambeth 10 per cent. maximum 3½, and Southwark and Vauxhall 5 per cent. preference 3. Friday was a steady day for Gas stocks—Bombay rising ¼; but renewed weakness prevailed among Water stocks. New River "D" debentures fell 2½, ditto "C" debentures 1½, Southwark and Vauxhall ordinary 2½, ditto 3 per cent. "B" debentures ½, ditto 3 per cent. intercommunication debentures 1½, East London 3 per cent. debentures 1, Kent 3 per cent. debentures ½, Lambeth 3 per cent. debentures ½, and West Middlesex 3 per cent. debentures ½.

THE FIDDES-ALDRIDGE GAS-STOKING MACHINE.

The gas industry has been for some time greatly interested in the various developments in machinery for discharging and charging gas-retorts; and there is still another invention being brought out, which is expected to do great things in the way of economical gas-making. The invention is the work of Mr. William Fiddes, late Chief Engineer to the Bristol Gas Company, and is patented and brought out in conjunction with Mr. J. G. W. Aldridge, of No. 9, Victoria Street, S.W.

In 1894, Mr. Fiddes patented a telescopic ram for discharging coke from horizontal through gas-retorts; and this was working successfully for some time. Later on he introduced a charger by which the coal was blown into the retorts. In consequence, however, of the smother attending this method of charging, it was abandoned; and it was realized by him that the best practical results would only be obtained where the two operations could be performed by one machine, which, while in the act of discharging the coke from, would simultaneously carry fresh coal into, and lay it evenly over the bottom of, the retort. The outcome of experiments in this direction is the machine described in the abstract of the patent specification given below.

This machine, which is entirely operated electrically from one end of the retorts, and by one man, is fed with coal from an overhead hopper; the coal passing down a shoot into a chain of push-plates unwinding off a vertical drum, and so carrying the coal into the retort in the exact quantity required for each charge, which may be increased or decreased as desired. Simultaneously with this, the coke is being discharged; so that (say) in the middle of the dual operation, which takes about 20 seconds altogether, half the coke is out of the retort, and half the fresh coal is in, which coal at the completion of the operation is left in the retort in an absolutely level layer, it is said, from mouthpiece to mouthpiece.

This, briefly stated, is the whole operation; and if in practical working it can be demonstrated as feasible, the advance it will make in the field of economic gas production will be great indeed. The temperature of the retorts will not be lowered as heretofore in the separate operations of discharging and of charging; and moreover carbonization does not practically commence until after the lids of the retorts are closed, which is evidenced by little or no flame or smoke being visible at the mouthpieces during the whole operation. The coke, too, being pushed out of the retorts in a compact, unbroken mass, little breeze is made; and the life of the retorts and their settings will be longer, as there is no momentary impact of any kind to cause damage to the settings.

The objections often urged against the employment of stoking devices which travel through the retorts, do not obtain with this machine, as no part touches the retort in its travel; and when wound upon the drum, after a complete operation, it is said that the hand can be placed upon any part of the machine without discomfort, so little is it affected by the heat—obviously, the result of the coal it contains all the while it is performing its operations. The machine, as described, it should be mentioned, is for use in shallow retort-houses. For wide houses, the vertical drum may be dispensed with, and the machine made straight.

The machine is exceedingly simple; and a temporary one (built for the patentees by Messrs. Stothert and Pitt, of Bath) was recently tried, and is reported to have demonstrated the success of the invention, at the Bath Gas-Works.

[Abstract of the Patent Specification.]

The patentees describe means for discharging coke from, and for charging coal into, through retorts in one and the same movement of the apparatus, so that the coal may be charged into retorts at the same moment that coke is being pushed out of the opposite ends. This is to

Fig. 1.

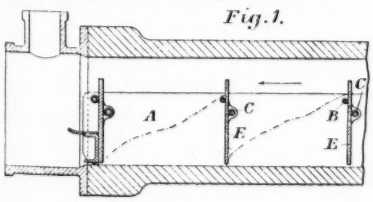


Fig. 2.

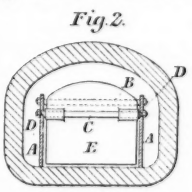
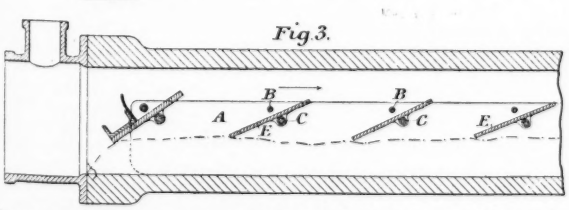


Fig. 3.



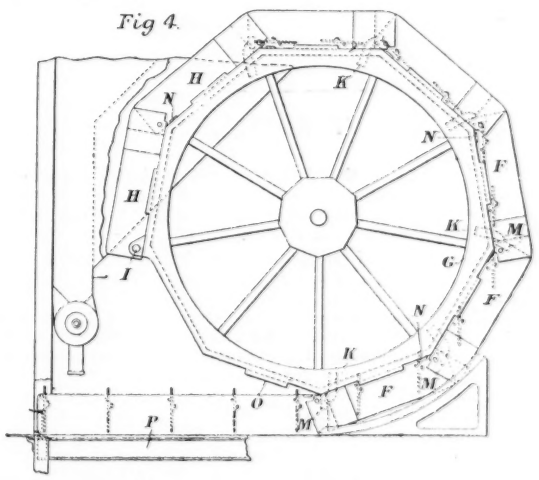
be accomplished by means of a "discharging charger," which pushes out the coke before it as it is pushed into the retort carrying with it its charge of coal, and which, when it is withdrawn from the retort, "leaves the charge evenly distributed over the bed of the retort." The discharging charger referred to consists of side plates, distance-pieces between the side plates near their tops, and division plates pivoted between the two side plates, and adapted to swing from their vertical position towards the forward end of the charger, but prevented from swinging beyond the vertical position towards the rear of the charger.

Fig. 1 is a sectional side elevation of the rigid discharging charger inside a retort, and fig. 2 is a cross section. Fig. 3 shows the discharging charger being withdrawn. Fig. 4 is a side elevation of a hinged or jointed discharging charger.

The discharging charger comprises the two side plates A maintained parallel to one another by rows of distance-pieces B C. The length of the side plates exceeds the length of the retorts; and the depth is less than the internal height or depth of the retorts. The distance-pieces B are secured in rows of holes, at fixed distances apart, in lines parallel with the edges of the plates near their tops—being regulated in proportion to the size of the retorts. The distance-pieces C are secured in rows of holes parallel to, but below, the other holes, and at the same distances from each other as those in the upper rows—the holes in the lower rows being situated obliquely below the holes in the upper ones. The plates are on edge at a distance apart from each other proportionate to the width of the retorts, and are secured by means of nuts upon the ends of the distance-pieces. The side plates thus form two sides of a channel to which the sole of the retort serves as the bottom when the apparatus has been pushed into the retort, and to which a moveable bed-plate outside the retort serves as the bottom when the apparatus is out of the retort. The push-plates E are pivoted to the lower distance-pieces so as to allow them to swing forward, but not backwards. The hinged plates, when vertical, rest against the upper distance-pieces so that they cannot swing backwards, but are free to be moved out of the vertical in one direction only. At the forward end of the apparatus the distance-pieces and push-plate are made heavier and stronger than those which follow, as they have to force the whole mass of the coke out of the retort, while the other plates have only to deal with coal between the adjacent push-plates.

The mode of using the apparatus is as follows: The apparatus is brought into position in front of a retort-mouthpiece on a suitable bed-plate such as P (fig. 4), and a forward movement is imparted to the discharging charger, while at the same time coal is caused to be delivered from the hopper in the spaces between the push-plates. As the discharging charger is moved forward, the coal in the spaces between the push-plates is pushed along the bed-plate into, and along, the bottom of the retort. The delivery of coal is maintained until the last space between the push-plates has received its coal, when the delivery is stopped. The forward movement of the discharging charger is, however, still maintained until the whole charge of coal is in its proper position in the retort. At an early stage in the operations referred to, the first push-plate encounters the coke which is lying in the retorts, and "imparts the forward movement to the whole mass of the coke," and causes it to fall from the furthermost end of the retort. A backward movement is now imparted to the discharging charger, and during this movement the push-plates take an inclined position and pass over the top of the coals which rest stationary upon the bottom of the retort, and in so doing "spread the coal of an even thickness over the entire bottom of the retort."

Fig. 4.



In cases where there is not sufficient distance between the retort-mouthpieces and the walls of the retort-house to work the apparatus as described, the discharging charger is made in sections as fig. 4. These sections F are hinged together in such a manner that each section in succession may be wound upon a polygonally constructed drum G or the like, placed vertically above the bed-plate. The ends of the sections have notches which engage lugs N on the adjoining sections and prevent "hog-backing" as the discharging charger is driven forward. Hinged plates H are affixed to the rear end of the discharging charger, corresponding in length and depth with the sections of the discharging charger, which also wind upon the drum. These plates serve to connect the discharging charger to the drum; and when the discharging charger is fully in the retort, they lie between the retort mouthpiece and the drum. The rear end of the plates hinged to the discharging charger is affixed to the drum at I, in order to impart either a forward or a backward motion to the discharging charger as the drum is driven in an unwinding or winding direction by suitable gearing attached to the bed-plate. The drum is provided with projecting teeth K, which act on the projections M, on the inner sides of the discharging charger, and so push it forward. The elongated projections O on the periphery of the drum between the sections serve to keep the discharging charger in its proper position on the winding drum.

THE VALUE OF THE PACKING IN GAS-COOKERS.

All preventable loss of heat from a gas-cooker means the waste of a portion of the gas used, and, in most cases, of time, with an increase of the temperature in the kitchen, where, as most householders well know, it is not frequently welcomed. Therefore, in the interests of both gas consumer and supplier, the best cookers are those which retain the greatest amount of heat for the quantity of gas expended; and one naturally expects that the packed oven is the one which attains this desirable end. Perhaps sufficient consideration is not always given to this point by buyers; but a few minutes' study of the results of a series of tests which have been conducted by Messrs. R. & A. Main, Limited, will show its importance—the efficiency of the packed as compared with the unpacked oven being proved to be considerably higher. The figures speak for themselves.

Tests of Temperatures.

Initial Heat of Oven.	Packed Cooker. 80°	Consumption. Cubic Feet.	Unpacked Cooker, with Enamel Door Plate and Lagging. 80°	Consumption. Cubic Feet.
At 5 minutes	240°	$1\frac{9}{10}$	200°	2
10 ,,	370°	$3\frac{1}{10}$	340°	4
15 ,,	440°	$5\frac{1}{10}$	420°	6
20 ,,	500°	$7\frac{6}{10}$	440°	8
25 ,,	520°	$9\frac{1}{10}$	460°	10
30 ,,	—	—	480°	12

Practical Cookery Test.

	Packed Cooker.	Unpacked Cooker.
Roast, weighing in each case 5 lbs. 10 oz.; similar cut in every respect, and equally cooked	1 h. 15. m. .. 18 ft. of gas	1 h. 35 m. .. 25 ft. of gas

The roast cooked in the unpacked oven therefore took 20 minutes longer, and 40 per cent. more gas.

Water-Heating Test.

One Gallon of Water in Open Pan.	Packed Cooker. 58°	Gas Consumption. Cubic Feet.	Unpacked Cooker. 58°	Gas Consumption. Cubic Feet.
Initial Temperature	..	—	..	—
At 15 minutes	100°	$5\frac{4}{10}$	90°	6
25 ,,	140°	$9\frac{1}{10}$	128°	$9\frac{2}{10}$
30 ,,	164°	$11\frac{1}{10}$	142°	$11\frac{1}{10}$
35 ,,	184°	$13\frac{1}{10}$	156°	$13\frac{1}{10}$
40 ,,	200°	$15\frac{1}{10}$	170°	$15\frac{1}{10}$
42 ,,	212°	$16\frac{2}{10}$	—	—
45 ,,	—	—	186°	$17\frac{3}{10}$

Note.—The ovens tested were almost identical in capacity; any variation being in favour of the unpacked cooker.

The tests are extremely instructive as showing the value of the packing; and we heartily endorse the remark made by the Managing-Director of Messrs. R. & A. Main (Mr. A. P. Main) when sending the figures, that "we think the results will be of considerable interest to gas engineers throughout the country."

PERSONAL.

Mr. R. Greenaway, the Secretary and Assistant-Manager of the Truro Gas Company, has been appointed to succeed Mr. J. Thomas (whose death was noticed in last week's "Journal") as Manager of the Bodmin Gas-Works.

Much to the regret of his colleagues and the shareholders, Mr. Blaber, the Chairman of the Sutton District Water Company, has been compelled through ill-health to resign his seat on the Board. Mr. Blaber has served the Company as a Director for 33 years; and on the death of Sir Allen Sarle, Mr. Blaber was elected to succeed him as Chairman. Mr. Blaber has been a Director of several other Water Companies—notably the Seville, Antwerp, Falmouth, and Guernsey. He was also Vice-Chairman and Chairman, and later on Manager, of the Brighton Water-Works Company, before the purchase of the undertaking by the Corporation. At the last meeting of Directors of the Sutton Water Company, Mr. W. H. Blaber, Mr. Blaber's eldest son, was elected to his father's seat on the Board.

On Monday evening last week, the employees of the Kirkcaldy Gaslight Company presented Mr. Macpherson with a piece of silver plate, and Mrs. Macpherson with a pair of silver-mounted toilet scent-bottles. Mr. R. M'Kerracher, the foreman of the works, presided, and in a few words expressed the regret of all the employees at Mr. Macpherson's retirement, owing to ill-health. He referred to the amicable relations that had ever existed between them, and hoped that the rest and quiet, and freedom from the heavy responsibilities of the position which he had so successfully filled for such a long period would tend to greatly improve Mr. Macpherson's health, and enable him to enjoy his well-earned rest. Mr. D. Auchterlonie, the workman who had been for the longest period (nearly 30 years) in the Company's employ, thereafter made the presentation, and stated that he had much pleasure in conveying to Mr. Macpherson this small mark of the esteem in which he was held by every one of them, and their great regret at parting with him. They had appreciated very much his great consideration and kindness to them, and the interest he had always taken in their welfare, while at the same time not overlooking the Company's interests. Mr. Macpherson, in acknowledging the gift, thanked the men very heartily for thus expressing their kindly feeling towards him. He remarked that anyone in his position had often a difficult duty to perform; as, while the employees had rights and interests, so had the Company. He had always tried to hold the scales of justice evenly between them; and he took it that the meeting that night showed he had succeeded in doing so. He was very pleased at the amicable relations which had always existed between them, and the loyal way in which the men had ever supported him. He, as well as they, regretted the cause of his retirement, and he thanked them for the expression of the hope that rest and quiet would benefit his health. He also, in the name of Mrs. Macpherson, thanked the men for their gift, and for the kindly thoughts which had actuated them in associating her in this way with the expression of their parting mark of esteem for himself. He trusted the kindly relations which had hitherto subsisted would be extended to his successor. Mr. Kincaid, who was present, was introduced by Mr. Macpherson to the employees as their new Manager, and received a hearty welcome.

OBITUARY.

We have to record the unexpected death, on Thursday last, of Mr. James Poole Wagstaff, J.P., who was Chairman of the Mitcham and Wimbledon Gas Company for some 11 years. In the early part of the year, Mr. Wagstaff was in one of the North London hospitals with a painful abscess; but when presiding at the meeting of the Company on the 25th ult., he appeared to have quite recovered. Mr. Wagstaff's father was one of the original promoters of the Wimbledon Gas Company.

Gas from Septic Sludge.—Through the courtesy of Alderman Sir H. F. Hibbert, of Chorley, an experiment has been made with the small gas plant in use at the Chorley sewage works to determine the gas-producing power of dried sludge from the septic tanks in Manchester. The mean of the experiments shows that a ton of dried sludge would give 5264 cubic feet of gas. The gas is stated to be of fair illuminating power, but contains much sulphur. The residue was powdery, containing a good deal of oxide of iron, some finely divided charcoal, and some free sulphur. The total liquor obtained from the three charges contained only a slight percentage of ammonia; and the small quantity of tarry distillate produced consisted largely of grease.

Zurich and Its Municipal Enterprises.—We have received from Herr Weiss, the Engineer of the Zurich Corporation Gas-Works, a copy of a very handsomely printed *brochure* prepared in view of the 43rd annual meeting of the German Association of Gas and Water Works Managers. It contains an elaborate series of maps showing the disposition of the town in regard to its gas, water, and electricity supply, tramway service, and sewerage scheme. The description of the gas-works is an amplification of that previously issued, and a translation of which appeared in the "Journal" during January, 1901; many of the illustrations given in our pages appearing in the work under notice. Copies of the book can, we, understand, be obtained from Messrs. Hofer and Co., of Zurich.

Thawing Frozen Ground.—Some interesting experiments were carried out in Germany last winter in thawing frozen ground by the application of lime. An area 14 feet long and 5 feet wide was covered with about 2 cwt. of slaked lime, and at the end of 16 hours it was ascertained that, with the temperature ranging from 28° down to 21° Fahr., the soil was thoroughly thawed at a depth of 16 inches from the surface, and that it could be easily worked with the pick for another 6 inches. The expense of opening frozen ground to the depth of very nearly 2 feet would, after the treatment described, be only about one-third of that required to do the same work entirely by the pick. The system might be worth a trial in the case of the opening of ground being necessitated during the prevalence of very cold weather.

Amendment in the Canadian Patent Law.—An important amendment in the Canadian Patent Act has recently passed both Houses of Parliament, and became law on Aug. 13. It should receive the attention of all manufacturers interested in protecting their rights in Canada. Referring to it, Messrs. W. P. Thompson and Co., of Liverpool, say: "The most important changes relate (1) to the obligation to manufacture the invention in Canada within a given period, failing which the patent will be rendered null and void; (2) to the introduction of a system of compulsory licences, whereby a patent may be placed outside of the obligation to manufacture, but subject to a compulsory licence, should the Commissioner decide in favour of the application for such licence. This division of patents in two classes will affect not only new patents to be issued, but also patents already granted, and all holders of Canadian patents who are not actually manufacturing their inventions in Canada, or who do not wish to manufacture there in the near future, should arrange to have such patents transferred to the new class—*i.e.*, subject to a compulsory licence, but free from the obligation to manufacture in the country. This should be attended to at once; but in no case later than six months after the date aforesaid of the new Act."

TECHNICAL RECORD.

VARIATIONS IN THE LIGHTING POWER IN THE INCANDESCENT BURNER OF COMBUSTIBLE GASES.

By E. Sainte-Claire Deville.

[**Abstract Translation of a Paper presented to the International Photometric Committee at Zurich.**]

(*Continued from p.* 568.)

II.—The Measurement of the Quality or Power of a Gas for Incandescent Lighting, with a definition of a proper Photometric Method.

Passing on to the laws of combustion as affecting the incandescent burner, it will be remembered that the researches conducted in the experimental works on the combustion of coal gases of different qualities in a Welsbach burner were made with gases ranging in quality from the poorest to the richest, and a number of conclusions drawn from the results obtained.

In the first place, the facts as to the maximum duty* obtainable were found to be as follows: With a No. 1 Welsbach burner, and any coal gas whatever, there exists, for every consumption, a maximum duty which corresponds with a certain value of the ratio $\frac{A}{G}$† existing between the volumes of air and gas which mix at the base of the burner. When the values for the maximum duty and the corresponding values of the ratio $\frac{A}{G}$ are determined by experiment for gradually increasing consumptions of the same gas, it is found that the duty and the ratio both go on increasing with the consumption until a certain limit is reached. When this absolute maximum is reached, the duty ceases growing. In fact, it soon decreases if the consumption of gas is further increased. $\frac{A}{G}$, however, remains unchanged at its maximum value. These conclusions hold good with all the different qualities of gas; but each quality of gas has a distinguishing characteristic—viz., the magnitude of the duty or maximum lighting-power and the corresponding value of the maximum for $\frac{A}{G}$. Taking things broadly—that is to say, without regard to minute variations—it can be said that coal gases consumed under the conditions necessary for their maximum duties give almost exactly the same intensity of light for a given quantity of heat. The corollary of this fact is that, for the same quantity of heat produced, the duty obtainable from a given volume of two different gases is proportional to the heats of combustion (by volume) of the gases. The proportion of air to gas, $\frac{A}{G}$ varies likewise—whatever the gas—with the heat of combustion of the gas.

As has been already noted, the aim of these numerous experiments has been to compare the lighting power (incandescent) of different gases; but when the series of tests was planned, there was no accepted definition of what is rightly called the lighting power (incandescent) of a gas. Obviously, as with the ordinary illuminating power, the incandescent lighting power can be defined in a general way, as "the duty (or intensity per 100 litres of gas per hour)‡ obtained on burning the gas in a Welsbach burner of the certain definite construction and such that each gas can be burnt under the conditions which best suit it." The question arises, What type of burner is implied here, and under what exact conditions must the gas be burnt? Various considerations show that, in dealing with these questions, it is convenient to adopt a provisional definition of the lighting power (incandescent) of a gas. This is comprised in the following: The type of burner is to be a No. 1 Welsbach fed with air; and the lighting power (incandescent) of the gas is to be measured by the absolute maximum duty of the gas when burnt with the largest proportion of air which can be used with it.

From the figures already given of 15 samples of coal gas tested with the No. 1 Welsbach burner, a table can now be compiled which displays the incandescent lighting power. The gases had all practically the same theoretical temperature of combustion—viz., 1950° C., and are arranged in order of their heats of combustion (water as steam).

* "Duty" is here held to be the quantity of light produced by 100 litres of gas, or its reciprocal—viz., the consumption of gas per carcel.

† The nomenclature adopted in this paper is—
A.—Volume of air introduced, per hour, at the base of the burner.
G.—Volume of gas " " " " "
I.—Intensity of the light of the burner.
C.—Heat of combustion (calories) of gas per cubic metre at 10°C. and 760 mm. (constant pressure and water as steam).

‡ Or inversely, the consumption of gas per carcel.

Table III.

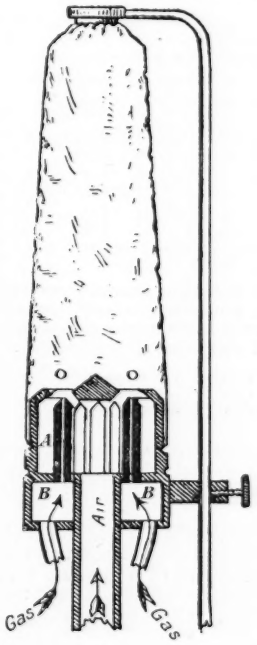
No.	Description.	Mantle Used.	Heat of Combustion at 10°C. and 760 mm. Calories.	Ordinary Illuminating Power or Consumption per Carcel in the Standard Bengel Test Burner. Litres.	Duty or Lighting Power (Incandescent.) as defined above. This item is given in its two usual forms: (a) Number of Carcels per 100 Litres of Gas consumed per Hour; and	(b) Consumption of Gas per Carcel. Litres.	Proportion of air to gas $\frac{A}{G}$ at the Base of the Burner, under the Conditions of Maximum Duty.
1	Coal l end of charge	K	3,489	*Nil*	6·77	14·9	3·18
2	,, i ,, ,,	H	3,868	299·4	7·76	12·9	3·64
3	,, k ,, ,,	J	4,264	168·2	7·36	13·6	4·03
4	,, j ,, ,,	I	4,343	164·3	7·62	13·1	4·22
5	,, h middle ,,	G	4,395	162·2	8·13	12·3	4·14
6	,, l ,, ,,	K	4,858	116·0	8·94	11·2	4·57
7	,, h ,, ,,	G	4,936	112·1	8·33	12·0	4·72
8	,, j ,, ,,	I	5,142	103·3	8·72	11·5	4·79
9	,, k ,, ,,	J	5,332	92·71	9·07	11·0	5·11
10	,, i ,, ,,	H	5,340	93·20	9·10	10·9	5·10
11	,, l beginning ,,	K	5,587	94·56	9·52	10·5	5·33
12	,, h ,, ,,	G	6,052	79·37	10·46	9·56	6·00
13	,, j ,, ,,	I	6,358	95 02	10·48	9·54	6·12
14	,, k ,, ,,	J	6,711	68·26	12·07	8·30	6·59
15	,, i ,, ,,	H	7,023	65·85	12·65	7·90	6·78

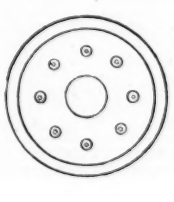
We have now only to consider the case of ultra-poor gases burning with a blue flame, the most interesting of which is water gas. These gases cannot be used with the ordinary Welsbach burner with previous admixture with air. Indeed, mixture with air is not necessary, since the flame has no tendency to deposit soot on contact with the mantle. In devising a burner specially adapted for the combustion of these ultra-poor gases, regard had to be paid to the requirement that the photometric tests should be comparable with those of ordinary coal gas. With this object in view, it was essential that the three following conditions should be fulfilled:—

1.—The burner to be supplied with measurable volumes of air and gas, in order that the combustion may be adjusted to the maximum luminous intensity for a given volume of gas consumed.

2.—The arrangement of the delivery tubes to be such that intimate mixing of the two gases takes place as completely as possible on their meeting at the lower part of the mantle.

3.—The burner should accommodate the same mantle (No. 1) as that used for coal gas.





It was found that a modification of the Strache burner answered these requirements. A burner, instanced as suited to practical needs, is shown in the accompanying diagram, in which A is the steatite air chamber, and O orifices by which the air reaches the mantle from the central delivery tube. B (of metal) is the gas-chamber, having, on its upper surface, eight nickel tubes, which conduct the gas to a point slightly below, but on the axis of the series of orifices.

It is noteworthy, in connection with the lighting power (incandescent) of water gas, ascertained under strictly comparative circumstances, that the water gas has a temperature of combustion distinctly higher than that of coal gas.

A table is given which, like the preceding one, shows how slight is the variation in the temperature of combustion of different samples of coal gas. In regard to this point both tables can be summarized as follows: 13 gases (taken towards end of distillation)—Temperature of combustion between 1939° and 1977°; mean, 1951°. 15 average gases, representing the whole course of the distillation—Temperature of combustion between 1946° and 1997°; mean, 1952·8°. 12 gases, taken at commencement of distillation—between 1938° and 1970°; mean 1953·8°.

III.—Summary and Conclusions.

Since June, 1901, measurements have been made, in the experimental works of the Paris Company, of the lighting power (incandescent) of coal gas; the figures being quantitatively interpreted according to the definition already given. Observations were commenced with a moderate consumption of gas; the air supply being adjusted to obtain the maximum intensity for this consumption. This having been measured, the test was repeated three, four, or five times with increasing gas consumption. In each instance, the ratio of absolute intensity to gas consumed was ascertained; and it was thus discovered that this ratio gradually rises to a maximum, at which it remains for some time, and then falls. Taking the mean of all the determinations in which the maximum was practically constant, data are obtained representing the characteristic constants of the various gases. For example, in one experiment the data were:

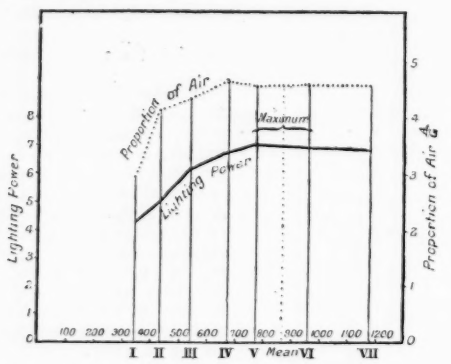
Ordinary illuminating power—*i.e.*, consumption per carcel, at 10° and 760 mm. by Dumas and Regnault's method (litres)	122·0
Density of gas, at 0° and 760 mm.	0.3695
Heat of combustion per cubic metre at 10° and 760 mm. (water as steam) (cals.)	4697
Description of mantle	A

Determination of Lighting Power (Incandescent).

No.	Gas Consumed, Litres. G.	Air Consumed, Litres. A.	Ratio, $\frac{A}{G}$.	Absolute Intensity, Carcels, Ia.	Intensity per 100 Litres of Gas, Carcels.	Heat Produced, Calories, G x C.	Intensity per 1000 Calories, Carcels, $\frac{Ia}{G \times C}$.
1	74·0	218·0	2·95	3·20	4·32	347·6	9·21
2	92·4	384·0	4·16	4·68	5·07	434·0	10·79
3	115·5	502·5	4·35	7·20	6·23	542·5	13·27
4	144·0	670·5	4·66	9·96	6·92	676·4	14·73
5	165·0	753·0	4·56	11·68	7·08	775·0	15·08*
6	204·6	942·0	4·60	14·28	6·98	961·0	14·86*
7	251·1	1155·0	4·60	17·31	6·89	1179·0	14·67
Mean of 5 and 6	184·8	847·1	4·58	12·99	7·03	868·0	14·97

* Zone of the maximum value.

These results can be shown graphically by taking the quantities of heat produced as abscissæ and the intensities per 100 litres of gas as ordinates. The curves thus obtained indicate the facts already pointed out.


Proportion of Air
Maximum
Lighting Power
Lighting Power
Proportion of Air
100 200 300 400 500 600 700 800 900 1000 1100 1200
I II III IV V Mean VI VII

The effect of the mantle (on the luminous intensity per 1000 calories) is very marked. By taking the means of three separate series of the gases—a different mantle being used in each series—it was found that the luminous intensity varied as follows:—

Mantle K	14·69—1·00
,, A	15·14—1·03
,, B	15·70—1·07

Or a variation of 7 per cent.

Making a similar comparison, but of gases (rich and poor) in groups, it was found that the lighting power per 1000 calories varied only 1 per cent.—a difference which is within the experimental error of the determinations.

In regard to this question also the 15 gases given in Table III. may be grouped together into rich, medium, and poor, and the following figures obtained, showing the relative values for the rich and poor gases, when the medium gas is taken as unity:—

	Heat of Combustion per Cubic Metre. Calories.	Heat Produced. Calories.	Lighting Power or Intensity per 100 Litres. Carcels.	Luminous Yield for Heat Produced. Carcels.
Rich gases	1·24	·93	1·25	1·01
Medium ,,	1·00	1·00	1·00	1·00
Poor ,,	·79	1·06	·85	1·07

Here, again, the difference between the yields of light per 1000 calories is trifling compared with the same per 100 litres of gas.

Again, in 1894,* 42 samples of gas, varying in richness, were used by the author in a No. 1 Welsbach burner fed with air, and very similar to that which has been adopted as a typical burner. The heat produced was about 350 to 500 calories per hour. By grouping these gases into six sections, according to their richness, the following comparative figures are obtained, in which the average gas C is taken as the unit of comparison. The absolute values for gas C are: Heat of combustion 5250 calories per cubic metre, consumption 71·14 litres per hour, and intensity of light 4·069 carcels.

Gas.	Heat of Combustion.	Yield of Light.	
		Per 100 Litres of gas.	Per 1000 calories.
A	·80	·81	1·01
B	·95	·93	·97
C	1·00	1·00	1·00
D	1·08	1·04	·96
E	1·24	1·17	·94
F	1·50	1·36	·91
G	1·65	1·53	·93

N.B.—Gases F and G were from cannel coal, and extra rich. C comprises the mean values of gases having almost the same properties as the normal gas of Paris, and is on this account taken as unity in the three columns.

Here, again, it will be seen that, among gases of extreme poorness and richness, the yield of light per volume varies from 80 to 153 per cent.; while per 1000 calories it varies only by 10 to 12 per cent.

This relative constancy of the lighting power per 1000 calories should be particularly borne in mind. It is true that experiments of this kind are rendered difficult by variations in mantles, and the difference in colour between the light under examination and the standard. These factors account for some minor discrepancies between yield of light and heat expended; and it can still be stated with confidence that the lighting power (incandescent) of different gases, tested under certain comparable conditions, is practically proportional to the heats of combustion of these gases—always supposing that the quantity of heat expended does not exceed the quantity required for the maximum yield of light. The above statement has been ascertained experimentally only in regard to coal gases normally having a white flame and burnt in a bunsen burner. The author believes that, with the same reservations, it applies almost equally to gases affording a blue flame (extra poor coal gas, water gas, &c.); but further experiments with a burner on the lines of that already mentioned are necessary to exactly confirm this supposition.

Considering, now, the interesting, though less economical, case in which, by increasing the consumption of gas and production of heat beyond that in each case necessary for the maximum yield of light, it will be found that poor coal gases permit a higher limit of brilliancy than do rich gases. This is because, in the case of poor gases, the products of combustion permit an actual temperature more nearly identical with the temperature of complete combustion than in the case of rich gases. In other words, dissociation becomes less predominant. In the case of water gas, theory indicates a higher temperature of complete combustion than in the case of coal gas; but the products of combustion contain more carbon dioxide, so that possibly the latter product tending, by dissociation, to limit the temperature, may discount the theoretical figure. However that may be, if not more than 600 to 700 calories are liberated with a No. 1 mantle, it will be found that, as with coal gas, the lighting power is roughly proportional to the heat of combustion of the gas. Water gas, however, should be burnt in an argand burner, such as that of Dr. Strache. Under these conditions, the mixture of air and gas is much less intimate, and may, indeed, be insufficient.

This comparison of gases and burners leads the author to say that there is nothing absurd in the statement that, for the same expenditure of heat, a burner for non-luminous gas may give more light than an ordinary coal-gas burner. But in such a case the reason of the anomaly lies in the burner, and not the quality of the gas. The non-luminous burner would utilize its gas better than does the ordinary burner coal gas.

The researches of 1901 have convinced the author that the usual definition of lighting power (incandescent) which has already been provisionally adopted, is not the best. The idea of a maximum, reached by repeated trials, was an enticing one; but it involves a great intensity of light, and severe wear and tear of mantles. A more fitting conventional definition of lighting power would be as follows: Take a No. 1 mantle (as ordinarily manufactured, and of given size), and use it on an air-fed burner, suitable for coal or non-luminous gas, as the case may be. Place the burner at one end of the bar of the photometer, and the standard light (of known value) at the other; the distances of each from the screen for equal illumination being such that the absolute intensity of mantle No. 1 shall be equal to 8 carcels, or about 80 candles. This done, adjust the consumption of gas and air until the equality of the two illuminations is obtained on the screen with the minimum consumption. Under these conditions, the mantles will not be overtaxed, and many gases can be tested without changing the mantle.

The author contends that, if this method be applied with exactness to gases of known calorific power, the lighting powers will be found exactly proportional to the heats of combustion (water

* The whole of this work was done with a single mantle, which was kept in good condition throughout the course of the experiments, a period of about two months.

as steam). Hence, a photometric test is superfluous; the figure for calorific power sufficing to give the value of a gas for incandescent lighting. It would then only be necessary to accept the conclusions—

1.—That heat of combustion is a true criterion of the value of a gas for incandescent lighting.
2.—That figures representing calorific power in earlier documents should be taken to connote (in the absence of evidence to the contrary) calorific power at constant pressure (water as steam) per cubic metre of gas at 10° and 760 mm.

In the author's opinion, any factor for converting heat of combustion into lighting power would be unadvisable and misleading to the public, as it would not provide for the enormous variations of burners, &c.

It may be advisable for gas, such as that supplied by a company to a municipality, to be described in terms of both lighting and heating power, with the object of giving the necessary information to all classes of consumers. A long series of experiments, representing nearly 700 samples of gas, has shown that the heat of combustion of coal gas, enriched with benzol or otherwise, even when so low as to coincide with a lighting power of 14 to 15 candles or 105 litres per carcel, reaches at least 4800 or 4900 calories. Now, a gas of this richness is the best which can be supplied to a consumer using the ordinary incandescent burners working without special air supply. This gas is of such quality that the minimum lighting power usually imposed in the interests of consumers who adopt flat-flame burners amply ensures the calorific power needed by consumers who employ incandescent burners.

Turning to the lighting power of mantles, the author supposes that the International Committee on Photometry will confine themselves to ascertaining and recommending a uniform method of testing the light obtainable with the various commercial mantle tissues. The following embodies the author's views as to how these determinations should be carried out:—

1.—Select a mantle material of given composition and mode of manufacture, and take the light it affords as unity.
2.—The dimensions of the mantle should be those of No. 1 of the Société de l'Incandescence. Only mantles judged correct in regard to size to be used as standards.
3.—Materials, tested for suitability for mantles, to be made up into No. 1 mantles, exactly like the standards.
4.—A coal gas of medium quality to be used. The calorific power, measured before the experiment, to be between 4900 and 5200 calories per cubic metre.
5.—The two mantles to be fixed to two burners with artificial air supply, and each to be supplied through a meter for air and gas.
6.—First calculate the gas required to give exactly 600 calories per hour, and set the standard burner to this amount, adjusting the air to obtain the maximum intensity for this consumption.
7.—The standard being now adjusted, proceed to obtain, with the other mantle, the same quantity of light with the smallest possible gas consumption.
8.—This done, proceed, during any convenient time, to determine the consumption of gas and air which give this equal illumination of the screen.
9.—The whole set of experiments to be finally repeated; using, however, the meters for the standard burner previously employed for the mantle under examination, and *vice versâ*.
10.—V^t and V^e being the mean gas consumptions for the standard and sample mantles respectively, the quantities of heat will be—

$$C \times V^t \text{ and } C \times V^e;$$

and the intensities for the same expenditure of heat—

$$\frac{1}{C \times V^t} \quad \text{and} \quad \frac{1}{C \times V^e}.$$

The ratio of intensity of the sample mantle to that of the standard is therefore

$$= \frac{V^t}{V^e}$$

Thus, to take an example, if the two gas consumptions are $V^t = 120$ litres and $V^e = 127$ litres, the comparative value of the sample mantle is $\frac{120}{127}$, or 0·945.

It would be well, the author thinks, for the Committee to go fully into particulars of the manufacture of the mantle to be used as the standard; giving details of the raw materials employed. Care should be taken to avoid identification of the mantle taken as the standard with any commercial article; for the first test of a mantle which was shown to be superior in lighting power to some one mantle on the market would seriously depreciate this latter. Tests of mantles as to their durability, &c., are very desirable; but the author leaves the study of methods by which these qualities are to be determined to those more competent to deal with them.

In a recent number of "The Decorator," Mr. L. Cruickshank Smith gave a table showing the relative economic value of different paints on a 20-year basis. The following are the figures, the highest value being represented by 100: Zinc white, 100; red lead, 77; red oxide, 71; white lead, 64.

RELATIONS BETWEEN SCIENTIFIC RESEARCH AND CHEMICAL INDUSTRY.

The Products of Coal Tar.

On the 3rd ult., Professor Raphael Meldola, F.R.S., delivered a lecture at the Oxford University Extension Meeting, taking for his subject "The Relation between Scientific Research and Chemical Industry." The opening sentences and the concluding section of the lecture are of more especial interest to "JOURNAL" readers, and are therefore reproduced below from "Nature" of the 27th ult., in which the full text of the lecture appears.

Professor Meldola said: The particular branch of science with which I have been asked to deal is perhaps better calculated to illustrate the intimate connection between scientific research and *productive* industry than any other subject. I emphasize the term *productive* industry, because it is desirable to distinguish between productiveness and trade—*i.e.*, buying and selling. With the latter I have nothing to do, beyond pointing out the very obvious principle that, without something to buy or sell, there would be no commerce; consequently productive industry must be put into the first rank. Now chemical products of various kinds are absolutely indispensable to all civilized nations. You may remember that many years ago Lord Beaconsfield said that the state of trade could be gauged by the price of chemicals. A writer in the "North American Review" in 1899 published an article in which he laid it down that the nation which possessed the best chemists was bound to come to the forefront in the struggle for industrial supremacy. Of course, "there is nothing like leather;" and I am bound to agree with him. Had he been an engineer or an electrician, he might perhaps have said the same for mechanical or electrical engineering. At any rate, it is perfectly safe to generalize his statement, and to declare that the nation which possesses the most highly trained technologists is bound to take the lead.

In so many ways does chemistry come into contact with nearly every branch of industry, that it is difficult to know where to draw the line in giving actual illustrations of the industrial results achieved through chemical research. It is not possible logically, for example, to distinguish between the results obtained through research directed towards the solution of a particular industrial problem and the results obtained as bye-products in the course of purely scientific investigation. Industry has been advanced, and always will be advanced, by both methods. Bearing in mind also that chemistry, in its widest sense, is essentially the science of matter—at any rate, until the physicist has electrified matter into his own domain—it is evident that we are concerned not only with the production of useful materials for direct consumption, but also with the production of materials required in other industries. Thus chemistry affects engineers through the metals, cements, and other materials used for constructive purposes, and through the fuels used as sources of energy; it affects the agriculturist on account of the relationship between the growing plant and the composition of the soil, as well as through the relationship between the composition of crops and their value as food-stuffs; it supplies materials for the pharmacist, for the manufacture of pottery, glass, and soap, for the paper maker, for the dyer and colour-printer, for the bleacher, tanner, brewer, and spirit distiller; it furnishes the explosives used in modern warfare; and it supplies photography with all the materials necessary for the practice of that art. Among later developments it may be claimed that the modern science of bacteriology is the outcome of chemical research, and the manufacture of anti-toxins—the industrial result of this science—has until quite recently been in the hands of the chemical manufacturers. I may remind you also that many important products, such as sodium, aluminium, phosphorus, calcium carbide, caustic soda, and chlorine, are manufactured by electrical processes, so that the demand for these products has given an impetus to the development of applied electricity.

It is obviously impossible (the lecturer proceeded to remark), in view of the enormous range of industry in which chemistry is directly or indirectly concerned, to do more on the present occasion than take a cursory glance at a few of the more striking cases illustrative of the connection between research and industry. As an example of the creation of an industry through research directed towards a special end, attention was first of all directed to the manufacture of optical and other glass at Jena. He next referred to the applications of chemistry to agriculture, and their industrial results so far as these have influenced chemical manufacturers. Equally instructive as illustrating the connection between scientific research and industry were his references to the production of alcohol and other valuable products through the agency of living organisms.

Alluding to the products of coal tar, Professor Meldola said: I have left but little time for dealing with an industry with which I have had long personal connection—the manufacture of colouring matters and other products from coal tar. The relations between scientific research and this industry are so intimate, and so frequently referred to in public, that it has become a kind of stock example for the use of those who wish to emphasize the interdependence of science and industry. The history of this industry, moreover, is particularly instructive from our present point of view, because it originated in this country in 1858, and

flourished here for a period of about twenty years, and then began to decline. The chief centre of activity for the production of coal tar products at the present time is Germany, where there are six large factories and a number of smaller ones. The aggregate capital of the six large factories amounts to some £3,000,000; and they give employment to about 20,000 people, including chemists, engineers, clerks and travellers, dyers and draughtsmen, workmen, &c. These large firms pay dividends varying between 5 and 25 per cent. upon their capital. The total value of the tar products manufactured in Germany exceeds £10,000,000 annually, and she supplies by far the largest proportion of the dye-stuffs used throughout the world. When, in 1866, I proclaimed our approaching fate with respect to this industry, I found that we were then using about 90 per cent. of German and other foreign colouring matters in this country, and my friend, Professor Arthur Green, of the Yorkshire College, finds that things are in about the same state at the present time.

The coal tar colour industry arose, in the first place, from an observation made by Dr. W. H. Perkin in 1856, in the course of a research having for its object the synthesis of quinine. He did not succeed in producing the alkaloid, but he noticed that analine, when oxidized, gave a colouring matter, which he manufactured and introduced under the name of "mauve," and so laid the foundations of an industry which has developed to its present colossal dimensions. The art of the dyer and calico-printer has been absolutely revolutionized by the introduction of the synthetical colouring matters prepared from coal tar. Of these, more than 500 are now available—each one a distinct and definite chemical compound with characteristic colour; each one with properties rendering it suitable for application to particular classes of fabrics. Every range of colour—including the deepest black—can be imparted, and every degree of brilliancy or dullness, or fastness to light, to washing and bleaching agents, &c., can be realized as required. The natural dye-stuffs, such as madder, which supplied alizarin for Turkey red, the cochineal insect, which furnished a red dye, the lichens and dyewoods, which were used by the old-time dyers, have been displaced, or are on the way to displacement, by the tar products. The most important of all the natural colouring matters, indigo, is, as you all know, among the latest of the achievements of industrial synthetical chemistry; and a great industry worth some £3,000,000 annually to our Indian Empire is threatened with extermination by the German manufacturers. Not a month passes without the introduction of new colouring matters; and so enterprising are the German colour makers that their pattern-books are issued with full directions in various languages, and trained chemists in their service will give personal instructions to our dyers in the application of new and unfamiliar colouring matters.

It is impossible to do more than allude in passing to the enormous influence of this greatest and most refined of all the chemical industries upon every other department of chemical manufacture. It has reacted, and is reacting, with ever multiplying ramifications upon the manufacture of the raw materials, such as acids and alkalis; it is revolutionizing the methods for producing sulphuric acid; it is pressing into its service electrolytic processes; and it has created new branches of engineering for the construction of special plant and machinery. The utilization of the infinity of compounds present in the tar is no longer restricted to the production of colouring matters. Valuable medicinal preparations, photographic materials, perfumes, antiseptics, the sweet-tasting saccharin, which is 300 times sweeter than sugar, an artificial musk which exceeds in intensity of odour any natural musk, are among the manufactured products from coal tar. The industry is the direct outcome of scientific research, it has been developed by research, and is being still developed by research. Both methods referred to in this address have been, and are, at work. The bye-results of pure scientific investigation are seized upon whenever they show the slightest chance of being industrially useful. Saccharin is such a bye-result. The chemical reactions which culminated in the industrial production of indigo were published by their discoverer, the late Dr. Heumann, as an academic discovery in the first place, and were developed industrially by the Badische Anilin and Soda Fabrik, of Ludwigshafen. By the other method, whole armies of highly-trained scientific chemists are constantly at work in the splendidly equipped research laboratories of the German factories, investigating new products and processes with the direct object of their ultimate industrial application.

Nor must it be forgotten that under the term "research" used in this connection is comprised also theoretical research. A close study of the history of this industry will show how throughout it has been vitalized by theoretical conceptions concerning the chemical structure of the molecules of organic compounds, and especially by the so-called benzene-ring theory of Kekulé, now so familiar to chemical students. The force of illustration of the connection between science and industry can, perhaps, go no further than in this case, where a purely abstract conception, based on a knowledge of the properties of the atom of carbon, has reacted upon a branch of manufacture to its lasting benefit.

The death is announced of Mr. Edward Jones, the Chairman of the South Wales Coal Owners, and a well-known Monmouthshire colliery proprietor. He was one of the oldest members of the Conciliation Board and Sliding-Scale Committee.

AN AMERICAN VIEW OF THE LEWES AND KRAMERS AND AARTS WATER-GAS PROCESSES.

The "American Gaslight Journal" last month reproduced from our pages (under acknowledgment) the translation of the paper read by Dr. Steger, of Amsterdam, before the German Gas Managers Association, on "Water Gas Manufacture by the Kramers and Aarts Process"—*ante* p. 173. Last month also "Progressive Age" (New York) printed the paper read by Mr. S. O. Stephenson before the Institution of Gas Engineers, on the "Lewes Process at Tipton"—see "JOURNAL" for June 16, p. 782. These reproductions have called forth the following criticism by Mr. F. C. Slade, of Yonkers, New York, which appears in the number for Aug. 24 of the former contemporary.

My first impression of the two "articles" was one of surprise that the respective writers should have exhibited such apparent unfamiliarity on subjects with which, as gas engineers, they should have been familiar, and which have been before the American public for many years.

The question of substituting a low-candle power gas with high flame-temperature for the prevailing illuminating gas, is a subject that will in a short time occupy the attention of gas engineers all over this country and Europe; and there is little doubt but that the result will be general adoption of such a gas, consisting of a body of blue water gas enriched by a suitable amount of cannel, or coal gas, or oil, as local conditions may advise. In working for this end, however, it is certainly unwise, in these piping times, to assume a premiss which does not consider the work of a generation of capable gas engineers.

Referring, first, to the Kramer-Aarts process, it is well known that several manufacturers have for years been selling apparatus for carrying out the general idea of the process, and at least one of these forms is identical with the system described as the Kramer-Aarts process. This apparatus involves a pair of generators working precisely as described in the article, save for a down air-draft, which permits of the utilization of the producer gas made during the blow—a point which was apparently not anticipated in the Kramer-Aarts process.

It may be of interest to the latter people to know that these American generators use bituminous or anthracite coal, coke, or wood; and a thermal efficiency in regular operation of 86 per cent. is common.

The operation described as the Lewes process dates back to a time sixteen years or more before the general adoption of carburetted water gas. The writer has in mind at least one company which for years passed a small amount of water gas through their retorts during distillation, to reclaim condensable hydrocarbons in the tar. The water gas was generated in the two lower retorts of the setting by passing a small amount of steam, oil, and air through an iron pipe in the retorts. The gases thus generated passed up through the rear of these retorts and through the upper retorts in which coal gas was being made, and out in the regular way. The result was a clean, rich gas of a much higher candle power than the coal gas; but no claims were made for increased yield, aside from the gas added by the steam and oil. This operation, however, was given up upon the advent of carburetted water gas.

Several forms of apparatus have been in use for reclaiming these condensable hydrocarbons; and they have usually given satisfaction and proved to be a wise investment. The apparatus usually operates by permitting the gas to pass through a series of diaphragms, over which the light oils direct from the hydraulic main are permitted to flow.

A few years ago, while engaged in some expert work—investigating the merits of the proposed new gas process—the writer, after a varied series of experiments, was forced to the conclusion that in operating coal gas benches in which blue water gas was a factor, a slight suction was necessary to prevent the light gas escaping through the walls of the retorts into the furnaces; and the furnace gases themselves had a way of getting through into the retort when the suction was ever so light. The decarbonization of the retorts by the water gas will produce this effect, no matter how much care is exercised. With iron retorts, which were used for a while in these experiments, this action was avoided, and results were obtained that could be relied upon; and it was found that preheated water gases in small quantities hastened the carbonization of the coal. Much of the condensable hydrocarbons of the tar were fixed in the gas, and there was an immaterial increase in the yield due to this action. But, at the same time, the specific gravity of the gas was decreased, owing to the decomposition of the heavy hydrocarbons—thus increasing the volume slightly.

I give below some figures on the assay of coal tar obtained from straight coal gas and afterwards when water gas is present:

	Straight Coal Tar.		Mixed Tar.
Pitch	72·31	..	79·16
Light oils	2·41	..	1·00
Anthracene oils	1·53	..	32
Creosote oils	1·95	..	12
Ammonia	21·80	..	19·40

The specific gravity of the gas fell from ·801 of the pure coal gas to ·690 of the mixed gas.

It is the opinion of the writer that when Professor Lewes has had the fickleness of water gas in coal gas retorts sufficiently impressed upon him, he will gladly forego even the benefits derived from the light oils in the tar, and be content to mix his gas in the purifiers, the same as common, ordinary gas men.

GAS-ENGINES FOR THE ST. LOUIS EXHIBITION.

According to the "Engineering Record" (New York) the gas-engine exhibit at the St. Louis Exposition of 1904 will doubtless be the most important feature of the power display; for it will not only contain many types of engines, but also several of unusual size. The "Scientific American" supplements this statement by the following particulars.

The power plant of the forthcoming "World's Fair at St. Louis" will contain, among other items, a 3000-horse power gas-engine, the production of the Société Anonyme John Cockerill, of Seraing, Belgium. This engine, it is believed, will be the largest gas-engine in service up to the time of its installation. The World's Fair power plant will embrace more than 40,000-horse power, and the installation will be wholly within the buildings comprising the machinery department of the exposition. For the most part, the prime movers of the power plant will be placed on either side of the main aisle running the full length down the centre of the Machinery Hall. This aisle will be about 1000 feet in length. The engines comprising the driving power of the exposition will include gas-engines, turbine engines, and high-speed steam-engines; but by far the most interesting feature of this power plant must be the gas-engine display.

The 3000-horse power gas-engine, above referred to, has two cylinders, each having a diameter of 51 inches. The length of stroke is 55 inches, and the revolutions per minute when developing 3000-horse power will be 85. The length over all of the engine is 67 ft. 1⅜ in. The bed-plate or foundation proper will have a length of 77 ft. 6 in.

The foreign exhibits for the St. Louis power plant were gathered by Lieut. Godfrey L. Carden, R.C.S. He has been engaged for nearly nine months in Europe in collecting late-type units for the machinery department, and more power was turned in by foreign manufacturers than could be used at St. Louis. While the John Cockerill gas-engine will represent the largest gas-engine in service up to the spring of 1904, Lieut. Carden states that when he was at the works of the Gasmotoren Fabrik-Deutz, of Deutz, near Cologne, he found that this establishment was engaged in completing designs for a 6000-horse power gas-engine, and that the statement was made to him that by 1905 gas-engines of this unprecedented size would be put on the market. When one considers the relatively small units in which gas-engines are built in America, the advanced stage of the gas-engine industry in Europe must be at once apparent.

In addition to the John Cockerill engine, there was secured a 1600-horse power gas-engine of the Oechelhaeuser type, the product of the house of A. Borsig, of Tegel, near Berlin. The Borsig engine will be attached to a Crocker-Wheeler electric generator; and the gas-producer will come from the German house of Julius Pintsch, of Berlin. The Pintsch gas-producer will have a capacity sufficient for developing 2400 engine horse power. The total weight of the shipment from Tegel for the Exhibition will approximate 660 tons.

An 1800-horse power gas-engine of the Nuremberg type will also be put in service at St. Louis. The drawings of this engine show a length over-all of 60 feet, and a breadth between extremes of 19 ft. 4 in. The fly-wheel will measure 18 feet, and at 1800-horse power the number of revolutions will be 92 per minute. Large as this fly-wheel is, it will be exceeded by that of the John Cockerill engine (already referred to), which will be 26 ft. 3 in. in diameter.

But, aside from the gas-engines displayed at St. Louis, the exhibit of high-speed steam-engines is bound to attract great interest; for it must be admitted that in the matter of high-speed engines of large powers, Americans have not made so much progress as foreign manufacturers.

Eastern Counties Gas Managers' Association.—The members are promised a very interesting meeting on the 16th inst. at Newmarket. The new President is Mr. J. H. Troughton, the Engineer and Manager of the Gas Company, who so long served, faithfully and well, the Association in the position of Hon. Secretary. His Chairman and Directors are sharing in the efforts to make the occasion successful; and they will first welcome the members at luncheon at the Rutland Arms Hotel. The business meeting will follow; and, in addition to the ordinary items, there will be the President's Inaugural Address, and a paper by Mr. S. Cutler, jun., on "Steel Construction in Gas-Works." Both of these features are bound to be extremely instructive. The business disposed of, visits will be paid to places of interest, in the town and district, among which will be some of the racing and horse-breeding establishments. Dinner at the White Hart Hotel will end the day.

THE APPLICATION OF OXYGEN IN CONNECTION WITH ILLUMINATING GAS.

A paper, bearing the title "Liquid Air: Its Manufacture, Distillation into Commercial Oxygen and Nitrogen, and the Application of Oxygen in the Industries, especially for Use in Connection with Illuminating Gas," was read by Mr. G. A. Bobrick at the recent annual meeting of the Pacific Coast Gas Association. As stated by the author, the object of his paper was to explain how the air we breathe, and which only a quarter of a century ago was considered a permanent gas, is now reduced to a liquid state, and also to explain the process of the fractional distillation of liquid air into its constituent gases, oxygen and nitrogen, and the value of the liquid and the gases distilled from it for use in the various industries, and especially the application of commercial oxygen in connection with the gas industry—the term "commercial oxygen" meaning a gas containing from 60 to 80 per cent. of oxygen. To make the subject clear, he first of all briefly reviewed the history of the liquefaction of gas, and described the processes now employed in the manufacture of liquid air and its distillation.

Proceeding to notice "Oxygen as an Aid to the Gas Industry," Mr. Bobrick said: It is well known that animal life in all its forms depends upon the presence of oxygen in the air, as without that element vital functions cannot be performed. Oxygen is also one of the elements of combustion; and every fire and commercial artificial light, other than electric light, is sustained only by an abundant supply of it. Illuminating gas, as is well known, readily burns in the air with the evolution of heat, which can be greatly intensified by the introduction of a jet of oxygen in the centre of the flame. The illuminating gas burning under these conditions is furnished with a supply of oxygen from the air on the outside, and almost pure oxygen from the interior—producing an intensely hot oxyhydrogen flame. Notwithstanding its enormously high temperature, this oxyhydrogen flame emits only a feeble light, because of the absence of proper radiants; but we need only apply its high temperature to some non-volatile and infusible solid to cause a considerable portion of the heat to be converted into radiant energy, which streams forth as a dazzling, white light. A piece of quicklime may serve as a radiator, but oxide of magnesia is better, and zirconia excels both.

Many successful experiments have been made in the application of a mixture of oxygen and illuminating gas for the production of light. The great drawback to this system of illumination has been the exceedingly high cost of oxygen; but now, with an abundant and cheap supply of that substance derived from liquid air, we may reasonably expect that this problem, of such vital importance to the gas industry, will speedily be solved.

Experiments in this line have been carried on at the Queen's Barracks of the British War Department; the flame of an oxyhydrogen burner, placed 18 feet high, being directed against a piece of quicklime, and the light reflected from a mirror. It was so intense that, at 100 yards distance from the light, the smallest type could be read. A smaller light surrounded by a glass globe was tried, and found to be so efficient that, at 30 yards distance, a pin could be distinguished lying on the pavement.

In New York City I constructed an oxyhydrogen lamp which consumed on an average a mixture of 10 cubic feet of illuminating gas and 8 feet of commercial oxygen per hour. It was placed at a height of about 25 feet from the ground, at a place where there were no other artificial lights. The flame was directed against a piece of quicklime and reflected from a silver plated mirror, 15 inches in diameter; and though the night was very dark, I could easily read the smallest type of a newspaper at a distance of about 250 yards from the light.

Commercial oxygen gas mixed with commercially pure hydrogen gas, water gas, and coal gas, were also tried in the experiments, and also oxygen saturated with a solution of naphthalene in petroleum, benzene, and many other substances. But it appeared that the most practical method was the mixing of ordinary illuminating gas with commercial oxygen; and the heat of this flame, properly applied, produced a most excellent light, superior to the electric arc, and devoid of the disagreeable violet colour of the latter.

As above stated, the principal drawback to the introduction of the oxyhydrogen light for purposes of ordinary illumination has been the heretofore exceedingly high cost of producing oxygen (over $30 per 1000 cubic feet). But since commercial oxygen can now be produced for less than 25 c. per 1000 cubic feet, with the prospect of a still further reduction to 15 c. per 1000 cubic feet, the oxyhydrogen light will soon come into general favour. The illuminating devices and the three 3000-candle power oxyhydrogen lights exhibited before this Association have not yet reached a sufficient stage of perfection; but this is due to the fact that only few experiments have been made in this line, for the reason that, owing to the high cost of oxygen, there has been practically no demand nor development in this line. But, as has been wisely said, "Necessity is the mother of Invention;" and having now both cheap oxygen and illuminating gas, I dare predict that, as the electric arc light partly replaced gas light, so will the oxyhydrogen light partially replace the electric arc lamp, which, as is well known, has never reached what may be called the stage of perfection.

I will take the opportunity of answering in this paper an objection which has been raised against the oxyhydrogen lamp, in that the calcium stick requires replacing. While I admit that this is so, it cannot be considered a more serious objection than is the carbon of the arc lamp, which also requires renewing. But this objection to the oxyhydrogen light is being overcome by the lately discovered rare earths for making the refractory cylinders; and these will last 30 days or more, even in very severe weather. Furthermore, in recent experiments I have been able to do away with calcium sticks altogether; and I hope that within a short time I shall be able to exhibit a lamp which will produce the same great amount of light as at present without the use of calcium or any other refractory substance.

As to cost, 8 cubic feet of an average quality of illuminating gas, if burned in about 6 cubic feet of commercial oxygen, will produce a light equal to that given by an electric arc consuming nearly 1 kilowatt per hour, and giving a light of over 2000 candles. At present, illuminating gas retails in the larger California cities at $1 per 1000 cubic feet; but not knowing the cost of producing this gas, I will assume, for the purpose of this paper, that the manufacturer's cost is (say) 50 c. per 1000 cubic feet, and the cost of commercial oxygen 25 c. per 1000 cubic feet:

8 cubic feet of gas at 50 c. per 1000	40 c.
6 ,, ,, oxygen at 25 c. per 1000	15
	55 c.

This is but a little over ½ c. per hour for a light of over 2000-candle power. The city of Los Angeles, for the sake of illustration, pays for about 1100 electric arc lamps (which are supposed to be of 2000-candle power each, but which are in reality of only about 1000-candle power, and at times less) at the rate of $81 per lamp per annum for about 3500 hours' use, or at the rate of about 2·3 c. per lamp per hour. It will, therefore, be readily seen that the oxyhydrogen light can more than successfully compete with the arc lamp, not only for general illuminating and the lighting of halls, theatres, churches, stores, &c., where a much higher price is usually obtainable, but also for street lighting; and oxyhydrogen gas consuming appliances can also be successfully and economically used for general domestic and manufacturing purposes.

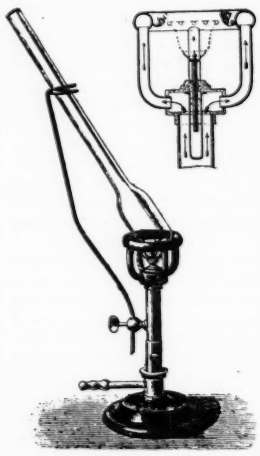
After dealing with the use of the oxyhydrogen blow-pipe in the steel and iron industries, the lecturer concluded: Air is yet in its infancy, and it is not wise for us to prophesy what it will or will not do. Our knowledge and means of handling and using it increase daily; and while exaggerated and unfounded claims have been made for it by the misinformed, others have not given it due credit. So let us remember that this is an age of wonderful discovery and invention, and that we are only beginning to know the world, its forces and resources; and because we cannot to-day see the whys and wherefores of all scientific truths, we should not be incredulous. The experience with the telegraph and telephone, gas and electric lights, electric cars, the air crane, &c., is still fresh in our mind. Liquid air is now added to the list, and we are prepared to see its use before long in many ways that cannot be even imagined to-day. But if one should ask of what value is liquid air or oxygen to-day—aside from applications to medicine, surgery, scientific research, and some minor industries—I will reply by quoting the words of the illustrious Benjamin Franklin, who to a like question replied: "Of what use is a baby?"

BRICKLAYING IN FROSTY WEATHER.

The complaint that one hears as to the want of employment in the building line owing to bricklayers not being able to pursue their work in frosty weather is attacked in the latest report issued by our Consul-General at Stockholm. He points out that it is an everyday occurrence to see bricklaying being carried out in Stockholm during the winter months. The art of building stands very high in Stockholm; much of the work being both ornamental and of excellent quality. A few years ago a series of experiments were carried out to decide the lowest temperature at which bricklaying might be effectively carried on. Three different temperatures decided on were 23°, 14°, and 6° Fahr. The bricks and mortar were, as to quality and conditions, such as are commonly used in Stockholm. The walls thus erected during winter were allowed to stand till the following autumn, when they were torn down, and the results noted were that those built at 23° and 14° were perfectly satisfactory; the mortar being quite hard and sound, and had to be scraped from the bricks. Those laid at 6° were not satisfactory; the mortar did not adhere to all the bricks, which lay loosely embedded in it. These results tend to prove that, without any special precaution as to material or labour, bricklaying can be carried on in Stockholm at a temperature as low as 14° Fahr., or 18° of frost. Generally, it may be said that the mortar should be made in a room where the temperature is kept well above freezing point. The brick used in Sweden is of a light or porous character, which readily absorbs the moisture from the mortar. Hard-pressed or calcined bricks and stonework generally are not suitable for building during frosty weather, but edgings or ornaments, &c., of such material can easily be dealt with by slightly warming them before bringing them into position. This can be done by keeping them a few days in a wooden shed heated by an open coke-stove. In some cases, it is found advisable to cover in with rough boarding the part of the wall where such stone-work is extensive; then a very small coke-fire is found sufficient to keep the temperature high enough to prevent any damage to the mortar. But though brick building can thus be carried on safely under any of the temperatures already named, this does not apply to plaster or cement work, which should not be done at or below freezing-point, unless proper heating arrangements are made. In Stockholm fifteen or twenty years ago almost all building was broken off during four or five months every winter. It is now the exception that it is hindered by frost for more than a few days or a few weeks annually. "(1) The bricks should be porous and perfectly dry, that they may readily absorb the moisture in the mortar; (2) the water, sand, and bricks must all be heated." This is the summing up of the Consul-General on this matter, which is of interest to gas engineers but not so much as to those engaged in other branches of building work, seeing that the most convenient time for proceeding with bricklaying in a gas-works is not during frosty weather.

A NEW GAS-BURNER FOR ASSAYING GOLD, &c.

In the current practice of assaying gold, silver, and platinum (says the "Annales de Chimie Analytique") there are several difficulties met with when, after cupellation, the metals are treated with boiling sulphuric or nitric acids heated over bunsen burners; but it is claimed that all of them are remedied by the use of the new burner illustrated herewith. The gas issues from holes on the inside of a ring; so that the heating is annular, and boiling is produced on the sides instead of the bottom of the matrass. As, too, heating has to be operated at different heights, the bottom of the matrass is supported by a copper device shaped like a jagged tulip, soldered to the top of a screw which can be raised or lowered in the axis of the ring. The tail of the screw works in a tube, to prevent loss of gas. With this burner there is no need to employ any charcoal which is sometimes inconvenient.



British Rainfall Statistics.—After a connection extending over thirty years with the British Rainfall Organization, Mr. H. Sowerby Wallis has been compelled by ill-health to retire from the work, which will henceforth be carried on under the sole charge of Dr. H. R. Mill.

Municipal Trading Committee's Report.—The report from the Joint Select Committee of the House of Lords and the House of Commons on Municipal Trading (which was noticed in the "JOURNAL" for the 11th ult., p. 357), together with the proceedings of the Committee, minutes of evidence, appendix, and index, was issued as a Blue-Book at the end of last week. The document is a bulky one, consisting, as it does, of no less than 480 pages. Some 31 witnesses were examined; and the total number of questions put to them reached nearly 4000.

Visit of Junior Gas Engineers to Beckton.—Through the courtesy of Mr. Iago, the Engineer, the members of the London and Southern District Junior Gas Association were on Saturday permitted to visit the Beckton Gas-Works. A good number took advantage of the opportunity; and the excursion proved a very pleasant one. The party were met at the works by the President, Mr. Walter Grafton, who acted as leader; and, under his able guidance, the visit was made both interesting and instructive. At its conclusion, a hearty vote of thanks was accorded to the Engineer for allowing the members to inspect the works, and to Mr. Grafton for the trouble he had taken in conducting the party over them.

Southern District Association of Gas Engineers and Managers.—The customary excursion meeting of the Association is somewhat belated, owing to the absence abroad of the President (Mr. Joseph Tysoe, M.Inst.C.E.) in the interests of the gas industry, as recently explained in the "JOURNAL." It has now been arranged that the members shall visit, on the 17th inst., the huge works of which the President has charge at East Greenwich, where there are several new and important features to be seen. On arriving at the works, the gasholders, governor and fan house, and the breeze-washing plant will be inspected; and then there will be an interval for luncheon, to which the South Metropolitan Gas Company have kindly invited their visitors. The afternoon will be devoted to the completion of the inspection; and at five o'clock brakes will leave for the Crystal Palace, where dinner will be served at 6.30. The day being a Thursday, the visitors will have an opportunity of witnessing the weekly firework display.

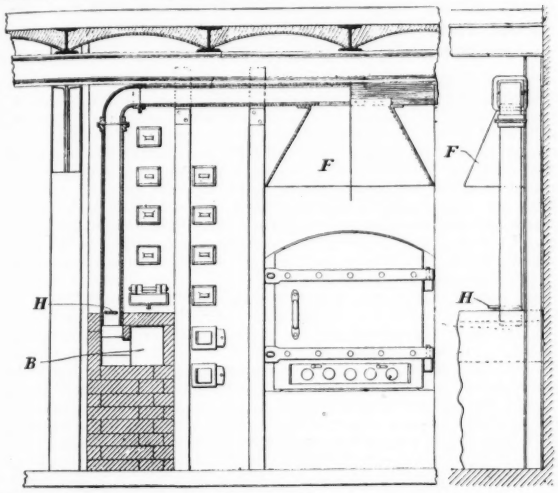
REGISTER OF PATENTS.

Discharging Coke from, and Charging Coal into, Gas-Retorts.—Fiddes, W. W., of Bristol, and Aldridge, J. G. W., of Victoria Street, S.W. No. 10,480; May 7, 1902.

Reference to this patent appears elsewhere to-day, *ante*, p. 615.

Furnaces for Gas-Retort Settings.—Jeffery, C., of Ware, and Gibbons, W. P., of Lower Gornal. No. 19,597; Sept. 8, 1902.

When clinkering the furnaces of gas-retort settings of the regenerative or generator type (particularly if the cellar for the furnaces is built underground), there is generally formed in the subways (say the patentees) a quantity of steam and sulphurous fumes detrimental to the men employed. The object of their invention is "to provide ready and efficient means for the automatic removal of the steam and fumes by means of the natural draught of the retort-settings."



A front elevation is shown (partly in section) of the furnace of an ordinary retort-setting with the invention applied; also a side elevation. The patentees provide a hood F (of sheet iron or other suitable metal) fixed before the front wall of the setting, and immediately above the furnace-door, shaped to catch the steam and fumes arising therefrom. The lower part of this hood is open, and is of about the same width as the furnace-door; and the depth from front to back is made about 15 inches more or less. The upper part of the hood is continued right and left; and these continuations are carried down to openings in the retort-setting communicating respectively with the waste-gas flues B—leading to the chimney-stack. The openings are regulated or entirely cut off by ordinary dampers H. When it is desired to draw off the steam and fumes arising from the cellar, the dampers are opened, and the draught passing along the waste-gas flues to the stack draws the fumes up the hood F into the waste-gas flues by the natural or chimney draught.

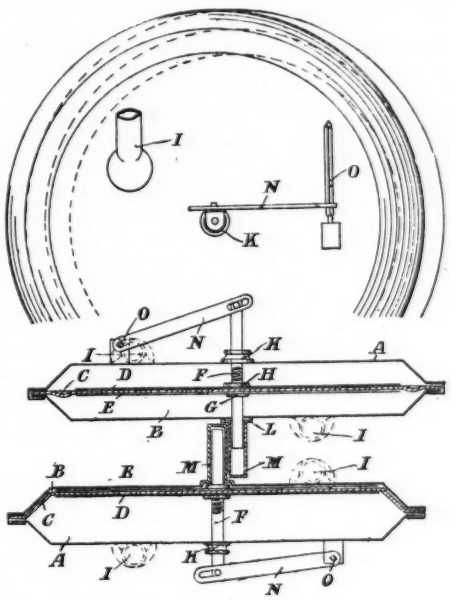
Dry Gas-Meters.—Aron, H., of Charlottenburg, Germany. No. 24,119; Nov. 4, 1902.

The object of this invention is to secure steadiness and accuracy in the indications of the meter. Such steadiness and accuracy have hitherto been wanting in dry gas-meters, says the patentee, because the diaphragm of the bellows constituting the measuring chambers, when forced into either of its extreme positions by the pressure of the gas, is very liable to deviate from the vertical position and to form plaits or folds of varying shape and size, whereby the capacity of the measuring chambers is rendered inconstant. The object of the inventor is to prevent such deviations, and also to prevent the formation in the extreme positions of plaits or folds in the flexible material of the bellows (which has hitherto consisted of leather or gas-tight fabrics), by providing suitable means for guiding the diaphragms of the two or several reciprocating bellows of the meter in their movements from one extreme position to the other.

The illustration shows a plan of one of the measuring chambers of a dry meter, and a central section through the two chambers of the meter, juxtaposed as usual, and working within a gas-tight box or casing in the well-known manner. The surrounding box of the two measuring chambers, the slide valves alternately connecting the two gas-ports with the discharge pipe, and the mechanical means for transmitting motion to the slide valves and to the recording gear, are of any known kind.

The two measuring chambers consist of two halves A and B, preferably of sheet metal, jointed together at the periphery by making their edges overlap each other; the edge of the flexible diaphragm C being engaged between the two edges of the chamber, thereby forming a gas-tight joint. The gas alternately entering into one of the ports I reciprocates the diaphragm from one of its extreme positions to the other. While in one chamber the diaphragm has reached its extreme position, the diaphragm in the other chamber will take up an intermediate position. The positions of the two diaphragms in the two chambers are never the same, but following each other, to secure a continuous flow of gas and to overcome the dead-point of the crank-shaft by which the slide valves are controlled and the recording gear actuated.

The main portion of each diaphragm is engaged between two discs D and E, preferably of sheet metal, secured to the flexible diaphragm. A rod F centrally traverses the diaphragm and its two holding discs; being tightly secured to the discs by a collar G integral with the rod, and a nut H screwed to a thread of the rod. By the reciprocating motions of the diaphragms in the two chambers, the rods will also be



given a corresponding and regular to-and-fro motion in the direction of their length. To ensure the perfectly straight movement of the rods and diaphragms with their holding discs, the rods are guided in stuffing boxes on the faces of the discs, and in bearings L having tubular extensions behind the discs. Owing to the straight motion of the rods and the parts secured thereto, the diaphragms, on arriving in the extreme positions of their reciprocating movement, are compelled to assume the shape of truncated cones. No creases or folds will occur in the flexible diaphragms, and the capacity of the measuring chambers formed in the two extreme positions of the diaphragms will consequently remain the same in every throw.

The end of each of the two rods F, extending from the chambers through the stuffing-boxes, is linked or connected to a lever N, which is secured upon a shaft O. The oscillating motions of the two shafts caused by the movements of the rods are transmitted to a common shaft in such a manner as to impart a continuous rotating motion to the shaft, which commands the slide valves and also drives the recording gear of the meter.

Membranes for Dry Gas-Meters.—Aron, H., of Charlottenburg, Germany. No. 24,120; Nov. 4, 1902.

In his specification, the patentee remarks: It is a well-known fact that dry gas-meters are very liable to change their indications in course of time, owing to the influence of the gas upon the condition of the diaphragm. On trying a dry gas-meter which has been used for a certain length of time, it will be found that its indications differ up to 10 per cent., or even more, from the indications given at the beginning. The reason for the deviations is this, that the materials employed for the diaphragm are liable to change their size under the influence of the gas; and owing to change of the membrane, the space serving to measure the volume of gas passing is contracted, and the indications accordingly change with the volume of the measuring space. The diaphragms of dry meters usually consist of greased tanned leather or of fabrics permeated with a suitable substance, by which tightness is obtained. Tanned leather is liable to shrink after a time, whereby the space serving to measure the volume of gas passing becomes smaller and smaller; and when permeated fabrics are employed, the substance by which the fabrics have been impregnated becomes loose under the influence of the gas, and the fabrics shrink, thereby causing deviations similar to those occasioned by the greased tanned leather.

To avoid changes of this kind in the volume of the measuring chambers of meters, mechanical means have been invented—such, for instance, as enclosing the diaphragm between metal surfaces, and leaving uncovered only so much of the fabric as to permit the required flexibility of the diaphragm. But even by such mechanical means, he points out, the desired constancy of the measuring chamber, and consequently the steadiness of indications, has not been obtained. But, after a long series of trials, he claims to have succeeded in finding out a reliable material for the purpose.

It is known that the conversion of animal skin into leather is due to the deposition of substances from the tanning or dressing medium, so as to prevent the fibres of the skin from pasting together when dried. When the tanning process is performed by a medium containing tannic acid, the deposition consists of organic compounds in a high degree liable to change, and in consequence to also change in volume. For this reason tanned leather is very liable to shrink. A leather prepared with metallic compounds insoluble in water—such as ferrous or chromous compounds to prevent the pasting together of the fibres—is found to be almost perfectly exempt from change under the influence of the gas. A number of trials made with dry gas-meters of uniform construction but containing diaphragms of leather of different kinds have proved that, when employing a diaphragm of tanned leather, deviations

of 10 per cent. and more could be detected after a comparatively short time of use, while when employing a diaphragm of leather prepared with metallic compounds insoluble in water, deviations of scarcely 1 per cent. were experienced after a corresponding time. Owing to this invention, therefore, a "material has been found for the membrane or diaphragm of dry gas-meters which, compared with any other material hitherto employed for the same purpose, is by far superior and is not liable to change of condition.

Measuring the Supply of Gases, Liquids, and Vapours.—Buss, E., of St. Gall, Switzerland. No. 27,911; Dec. 17, 1902. Date claimed under International Convention, Dec. 18, 1901.

This invention has for its object to determine the quantities of gas, liquid, or vapour which pass through tubular conduits during a period fixed at will. For example, it may be applied to pipes which supply water to a large number of consumers, in order to record the quantities of water taken by the various consumers. But it may be used for other applications and for other liquids, and also, in case of need, for gases and vapours.

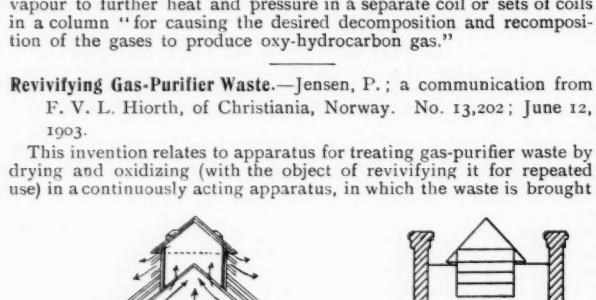
The feature of novelty in the invention is that, as a measure of the quantity of liquid or gas which passes through, the patentee proposes to employ the electrolytic action of an electric current, of which the intensity depends upon the speed of the current of gas or liquid. This intensity of current is regulated in such a manner that the quantity of "ions" transported, or of the matters dissolved or eliminated during a unit of time, is proportioned to the quantity of gas or liquid which has passed in the same time or to the complement of this quantity which would transform the principal current into a constant current.

Manufacturing Oxy-Hydrocarbon Gas.—Turner, C. W., of Brooklyn, U.S.A. No. 9573; April 28, 1903.

This invention relates to apparatus for manufacturing "oxy-hydrocarbon" gas from hydrocarbon oil and water under high heat and pressure, by separately vaporizing water and making superheated steam in one set of coils, separately vaporizing a hydrocarbon oil in a set of coils, then mixing the superheated steam and hydrocarbon vapours in regulated proportions and subjecting them in the mixed condition to a high heat in a combining and superheating coil, thereby producing a fuel gas or vapour, then subjecting such gas or vapour to further heat and pressure in a separate coil or sets of coils in a column "for causing the desired decomposition and recomposition of the gases to produce oxy-hydrocarbon gas."

Revivifying Gas-Purifier Waste.—Jensen, P.; a communication from F. V. L. Hiorth, of Christiania, Norway. No. 13,202; June 12, 1903.

This invention relates to apparatus for treating gas-purifier waste by drying and oxidizing (with the object of revivifying it for repeated use) in a continuously acting apparatus, in which the waste is brought



into the apparatus at one place and removed in revivified state at another place without necessitating intermediate manipulation.

The apparatus shown—two vertical sections at right angles to each other—is built up in the form of a tower, at the foot of which are two openings B and C, closed by suspended doors D and E. Within the tower a continuously working conveyor-band is mounted. This consists of two endless chains F which run over wheels at the top, driven slowly by worm-wheel or other gearing. The chains are provided with suitable hooks in which rest bars that are fixed on the top of the conveyor cars or baskets. These cars, fitted with shelves for taking up the waste, are pushed into the tower through the opening B, so that the ends of the bars are caught by the chain hooks, and the car or basket is so taken up through the towers by the conveyor. When it comes down at the other side, it is brought out through the opening C.

Through the tower is passed a current of air, oxygen, or other "suitable gas," heated to a "suitable temperature." The air may be supplied by a fan L mounted below the bottom of the tower; and in the centre, deflectors M drive the air outwardly through the conveyor baskets. These deflectors may be provided with arms N, from which rods O may be carried down to hand levers P, by means of which the deflectors can be adjusted to different angles.

Producing Heating Gases free from Hydrocarbons from Gas-Containing Fuel.—Abel, C. D.; a communication from the Gasmotoren Fabrik-Deutz, of Köln-Deutz, Germany. No. 13,748; June 19, 1903.

This invention relates to a method of producing non-luminous heating gases free from hydrocarbons from gas-containing fuel in a gas-producer heated both at the upper and the lower ends, and whose gas discharge-channel is situated at an intermediate point in the height of the fuel column. The method consists in causing the hydrocarbons separated in the upper layers of the fuel to descend to such a depth through the incandescent body of fuel before passing off through the discharge-channel, that the hydrocarbons are entirely decomposed, and the gases consequently burn with a non-luminous flame. The lower part of the producer in this case serves only for the complete gasification of the coke produced in the upper part. It is, therefore, like an ordinary coke gas-producer with the usual upward draught; and its height is only determined by the necessity for allowing the entering air to combine perfectly with the carbon to form producer gas before passing away.

While with ordinary coke gas-producers this minimum height is (say the patentees) frequently exceeded in order to previously heat the upper fuel by the hot gases, and thus to utilize their heat more perfectly, such an increase of height has no object in the present mode of operating, as the fuel enters the decomposing process already in an incandescent state. Any such increase in height would only uselessly increase the cost, and the space occupied by the producer; the detaching of clinkers would also be more difficult, and the loss of heat through radiation would be increased. Thus it will be seen that the lower part of the producer has its practically determined height, the same as the upper part; and it has been proved by the inventors that for the production of the required gas according to this invention the upper part must be larger than the lower part.

The non-luminous gas produced according to this invention is said to be more uniform in its composition than the luminous gas taken off from the higher layers of the producer in the usual manner, as the zones where the decomposition of the tar and the gasification of the hydrocarbons take place overlap each other, and the producer cannot be practically so worked as to maintain a constant height of the fuel. If, therefore, this height sinks somewhat, the place where the gases are drawn off approaches somewhat nearer to the surface of the fuel, and more undecomposed tars will remain in the gas. If, on the other hand, the height of the fuel rises above the normal level, the discharge opening for the gases will be farther away from the surface of the fuel, and more gaseous hydrocarbons will be decomposed. Below the zone in which all the hydrocarbons have been decomposed into their elements, the gases cannot be subject to any further change. According to this invention, therefore, they are withdrawn at a point sufficiently below the zone to ensure that their composition will not be affected by any variations in the total height of the body of fuel in the produce that may occur in the practical working.

The heating gas, burning with a non-luminous flame, obtained by these means is not only more uniform in its composition, but also, on account of the complete decomposition of all the tars, it is "very much purer than the luminous gas prepared in the known manner." It has a lower heating capacity than the latter, and is on this account particularly suitable for working internal combustion motors, but less so for producing high temperatures; and, unless carburetted, it is, of course, not suitable for illuminating purposes.

The soot mixed with the gas can be readily separated therefrom, and can be re-introduced into the producer for conversion into producer gas. It can, however, be directly utilized at its place of production by introducing at the point where it is deposited in an incandescent condition steam with or without the addition of air, so as to convert it at once into water gas or producer gas.

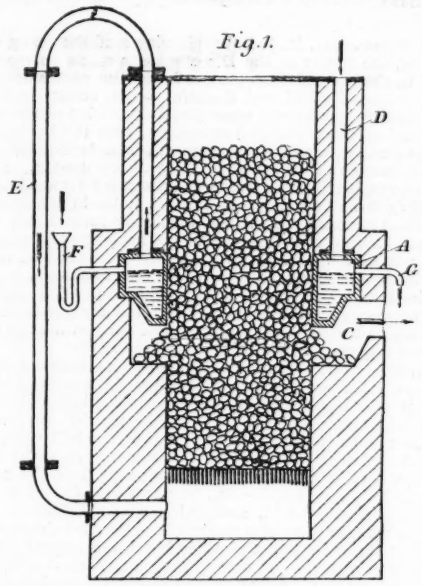
Fig. 1 (p. 625) shows, by way of example, one construction of gas-producer according to this invention.

The producer chamber is always open at the top, and has at the bottom a fire-grate that is accessible from the top opening of the chamber. The gases are drawn off through a channel C arranged at the proper point relatively to the height of the fuel-column. The fuel introduced at the top is heated by the incandescent layer below, and is firstly subject to distillation by such heat in becoming gradually incandescent, and then further gasified by the air passing through it. The residue consisting of incandescent coke then gradually descends into the lower part of the producer, where in coming into contact with the air entering through the grate, it is finally completely gasified.

The products of distillation disengaged in the upper part of the body of fuel, in being made by the draught to descend through the upper incandescent layers of fuel, will, before reaching the channel C, have become decomposed into non-condensable gases, possibly with separation of solid carbon, and pass away through the channel, together with producer gases formed in the upper and lower parts of the fuel. The

air entering through the fire-grate is advantageously moistened, for which purpose there is provided above the discharge-channel an annular water evaporating chamber A, in which a body of water is maintained at a temperature slightly below 100° C. This chamber is built into the brickwork of the producer in such a manner that the

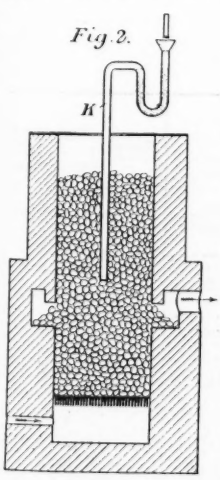
Fig. 1.



bottom of it forms the top of the annular discharge-channel C for the gases, and the inner side a portion of the producer chamber. By this arrangement of the evaporation chamber on the one hand, the excess of heat of the fuel at the discharging zone not being utilized by the process is usefully employed in generating the required steam; and, on the other hand, the downward projecting upper edge of the brickwork channel is made of a material that is less liable to be damaged by heat than brickwork.

The chamber A is made to communicate with the atmosphere through one or more pipes D, and with the ash-pit through the pipe E. The reduction of pressure effected in the producer chamber by the suction in the discharge-channel is transmitted through the ash-pit and the pipe E to the interior of the chamber A, causing air to be drawn in which, in passing over the surface of the heated water, takes up vapour or steam from it, and then passes with it through the pipe E into the ash-pit, and thence upwards through the incandescent column of fuel, where it is converted into producer gas. The water in the chamber A is maintained at a constant level by supplying continuously water through the pipe F, while the excess runs off through the overflow-pipe G; the supply being made sufficient to maintain the water in the chamber below boiling-point.

Fig. 2.



For utilizing the soot that is contained in the gases in the producer itself, as above stated, the large amount of free heat contained in the lower layers of the upper part of the fuel can be utilized for converting into steam water introduced at the point where the soot is separated, or steam may be directly so introduced. Fig. 2 shows the arrangement of a pipe K for this purpose, which descends through the upper body of fuel to the point where the carbon separates from the gas, and which is supplied with water through a syphon-bend at the top. The result of such steam supply will be the production of water gas mainly, if not entirely, from the separated soot, "as this offers very much more extended surfaces than the lumps of coke, and owing to its being in a nascent state it is much more disposed to enter into reaction."

APPLICATIONS FOR LETTERS PATENT.

18,241.—Klarhofer, O. D., "Gas-stove." Aug. 24.
18,264.—Engelfried, G., "Fluid-meters." Aug. 24.
18,281.—Hovey, A. C., "Travelling cranes for gas-purifiers." Aug. 24.
18,294.—Hall, F. E., "Gas-engines." Aug. 24.
18,361.—Hill, H., "Incandescent gas mantles." Aug. 25.
18,482.—Bennett, G. S., "Gas-regulators." Aug. 27.
18,492.—Garnier, J., "Combined gas and steam motor of the six-cycle type." Aug. 27.
18,505.—Moss, J., "Manufacturing gas of a high pressure, applicable for use as power." Aug. 27.
18,590.—Berthold, C. E. J., "Automatic gas-lighters." Aug. 28.
18,604.—The British Patent Tube Cleaning Syndicate, Ltd., and Hodgson, H. E., "Hatch-boxes for water, gas, or other pipes," Aug. 28.
18,608.—Melhuish, A. G., "Internal combustion engines." Aug. 28.
18,610.—Delamarre, H. M. H., "Incandescent lamps." Aug. 28.

MISCELLANEOUS NEWS.

PROVINCIAL GAS COMPANIES.

Gas.

Increased Profit at Hastings.

The report and balance-sheet submitted at the half-yearly meeting of the Hastings and St. Leonards Gas Company last Thursday stated that satisfactory progress is being made with the new works at Glyne Gap. During the six months, £20,000 of the new additional 5 per cent. stock was sold by auction, and realized a net premium of £4638. The number of consumers on the books at June 30 was 10,292, of which 6487 had ordinary and 3805 prepayment meters. The number of cooking-stoves on hire, including prepayment consumers, was 5856. There were 1643 public lamps, of which about 1000 were fitted with incandescent gas-burners. The remainder are gradually being altered. The accounts showed a profit balance of £11,536; and the Directors recommended the payment of statutory sliding-scale dividends at the following rates, less income-tax: 6½ per cent. per annum on the 5 per cent. converted stock, 5 per cent. on the 3½ per cent. converted stock, and £6 1s. per cent. on the 5 per cent. additional stock. The revenue account showed an expenditure of £32,323, and receipts totalling £43,859, thus leaving a profit balance of £11,536. The Chairman (Dr. G. G. Gray, J.P.), in moving the adoption of the report and accounts, remarked that there was very little to be said, because, so far as was within the range of their influence, everything had turned out satisfactorily. The profit balance showed an increase of £1476 as compared with the corresponding period of the previous year. Of this, £1204 was due to the increase in the receipts, and the remaining £272 to a decrease in expenditure. The additional receipts were made up as follows: Increase on the sale of gas, £293; on meters and stoves, £169; and on residuals, £647. For the first time for a considerable period, all the residuals showed an increase. With regard to the statement in the report about the erection of the works, the progress had not been so great as it otherwise would have been, owing to the bad weather, which had considerably handicapped them. This was, however, a cloud with a silver lining, because it had considerably increased their output of gas during the past month over what was the usual consumption for August. In spite of the increase in the number of users of incandescent gas, and the consequent large diminution in the amount of gas consumed, there had been an increase of 1½ million cubic feet during the half year. This increase was, however, not so large as in some years past. Still, the growth in the use of incandescent burners, so general in the town, was not at the present time anything which they should regard unfavourably. On the contrary, it had been of considerable assistance to them. When they went to Parliament for additional powers, they had almost got to their limit of manufacture; and if the consumption had gone on increasing as it was at that time, they would have found it difficult at the old works to meet the demand. But there sprang up this invention of incandescent burners to stop the consumption and facilitate the transfer from the old works to the new place. It had thus enabled them to go on more leisurely than would otherwise have been possible. They might, therefore, look upon the incandescent burner somewhat as a blessing. The report was adopted, and a vote of thanks passed to the Chairman and Directors and to the officers of the Company; Mr. Oke, who moved the latter vote, remarking that the Engineer (Mr. C. E. Botley) had had a very difficult task, and deserved great credit for what he had done.

Reduction in Price at Keswick.

The year ending June 30 last was a prosperous one for the Keswick Gas Company; and it was therefore decided at the meeting held recently to reduce the price of gas from 3s. 6d. to 3s. 3d. per 1000 cubic feet, as from July 1. The report stated that, after allowing for depreciation of cookers and bad debts, the revenue account showed a balance to credit of £1393 on the year. Deducting from this £80 for interest on loans and £73 income-tax, left £1242. The Directors proposed a dividend at the rate of 8½ per cent. per annum upon the original capital, and of £5 19s. per cent. per annum upon the additional capital. This would absorb £846, leaving the sum of £396 to be added to the profit and loss (net revenue) account. The amount of gas made was 19,088,600 cubic feet; sold, 17,801,400 cubic feet; used on works, 315,200 cubic feet; unaccounted for, 972,000 cubic feet—5·08 cubic feet on the make. The make per ton of coal carbonized was 10,658 cubic feet; and the quantity sold was 9939 cubic feet.

A Healthy Position at Richmond.

The accounts presented at the recent half-yearly general meeting of the Richmond Gas Company showed a sum of £5061 available for distribution; and the Directors recommended the declaration of a dividend of 5 per cent. per annum on the consolidated stock for the six months ending the 30th of June. In commenting upon the figures in the accounts, the Chairman (Mr. T. J. Carless) called attention to the fact that the expenses in connection with lighting and repairing the public lamps had been much reduced, wages were less, owing to better working, and upwards of £26,000 had been collected with only £32 as bad debts. The revenue from the sale of gas was about £1000 less, on account of the reduction of 2d. per 1000 cubic feet in the price; but the meter and stove rentals had increased at the usual rate, showing the progressive nature of the Company's business. Residuals had sold very well, and had materially helped to meet the decreased revenue from sale of gas; while the prospects for the coming half year were also satisfactory in this department. The profit and loss account showed a balance sufficient to pay the statutory dividend, with a small carry-forward; and it was very satisfactory that, notwithstanding the reduction made in the price of gas, they were enabled to earn their dividend. In conclusion, he referred to the general balance-sheet, which, he thought, showed a healthy position of affairs, there being sufficient funds in hand to meet the requirements of the Company for some time to come. The motion was carried without discussion,

and the dividend recommended declared. Among the votes of thanks accorded was one to the Engineer and Secretary (Mr. T. May) and the other officers of the Company, for their close and arduous attention to the interests of the undertaking. In acknowledging the compliment, Mr. May remarked that every member of the staff highly appreciated this testimony to their earnestness. He assured the meeting that they all had their hearts in their work, and he thought they could claim that the business had been very successful during the half year.

Adoption of Prepayment Meters at Sunderland.

The Chairman of the Sunderland Gas Company (Mr. G. R. Booth), in moving the adoption of the report at the annual meeting last Wednesday, said the total gross income for the year had been £117,000, against £121,000 in the previous twelve months. In 1902, however, the cost of producing gas and residuals was £108,793, leaving a net revenue of £12,969; whereas this year the cost of manufacture had been £102,900. There was thus an increased net revenue of about £1000. The decreased gross income was not owing to any loss of customers, but to the fact that large manufacturers had not required so much gas for power as they did in brisk times. In the matter of consumers, there had been an increase of 1400 during the last half year. With a view to increased economy and efficiency, the Directors had arranged for a complete installation of compressed air stoking machinery and coal-conveying plant at the Hendon works, where it had been in operation for some months, and was working satisfactorily. The Board had also recently commenced supplying gas through prepayment meters; and from the great demand which had arisen, they were fully convinced the system would become an important addition to the Company's business. The report was adopted, and dividends were declared of 5 per cent. on the original stock and 4½ per cent. on the additional capital stock of the Company for the six months to June 30.

Larger Make of Gas from Less Coal at Sutton.

The report which was submitted at the half-yearly meeting of the Sutton Gas Company yesterday week stated that the revenue from gas sold amounted to £10,445. There was an increase in the quantity sold over the corresponding period of last year of 1,659,000 cubic feet. The balance of profit and loss account available for dividends was £9229, from which the Directors recommended dividends at the rate of 10 per cent. per annum upon the original capital, and 7 per cent. upon the paid-up additional capital of the Company (less income-tax) for the six months to June 30. In moving the adoption of the report, the Chairman (Mr. F. Budgen) pointed to the fact that a larger quantity of gas had been made in the period under review. The increase amounted to 5½ per cent., which was very satisfactory; and what was still more satisfactory was that this greater quantity of gas had been made with less coal than was consumed in the corresponding half year. This was greatly attributable to the improved retort-settings, which had been erecting during the past eighteen months. The report was adopted, and the dividend recommended was declared.

AUSTRALIAN GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held at the Head Office, Sydney (N.S.W.), on the 30th of July—the DEPUTY-CHAIRMAN (Mr. S. Dickinson) presiding.

The SECRETARY (Mr. R. J. Lukey) having read the notice convening the meeting, the report of the Directors was taken as read. In the course of it, they stated that the profit for the past half year (after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges) amounted, with the balance brought forward, to £60,511; and they recommended the payment of a dividend for the six months of 9s. per share, free of income-tax. This would absorb £56,250, leaving a balance to be carried forward to the next account of £4261. The Engineer (Mr. T. J. Bush) reported that the whole of the Company's plant was efficiently maintained. The new gasholder at Rushcutters' Bay, capable of holding 400,000 cubic feet of gas, was put into operation on June 4. This station, including a governor-house, pumping machinery, and additional and larger mains, had involved an expenditure of about £20,000. The extension was rendered necessary by the increasing demand for gas in the Eastern Suburbs, which had now been fully met. Penny-in-the slot meters are still in great request; 15,800 being at present in use.

Mr. DICKINSON, after passing a tribute to the Chairman of the Company (Mr. G. J. Cohen), who was at the time of the meeting in England, said that it now became his duty to move the adoption of the report, which he had much pleasure in doing in the following resolution: "That the report of the Directors for the past half year, now read, be received and adopted, and that this meeting do order and determine that a dividend for the half year be paid at the rate therein recommended by the Board—viz., 9s. per share, free of income tax." The balance-sheet, he said, revealed a very satisfactory half-year's work. The revenue showed a marked increase over the corresponding period of last year; but, on the other hand, the expenditure had also considerably increased—principally owing to their having to pay a higher price for coals, heavy Customs duties imposed by the Federal Government, and increased cost of renewals and repairs, mainly at the Mortlake works. The returns from residuals were satisfactory, with one exception—viz., coke. Since the conversion of trams from steam to electricity, the demand for this had not been so great; but the Directors were not without hope that other outlets would shortly be found for it, and that the present stock would gradually disappear in consequence. With reference to the demand for gas, it was pleasing to note that the increase was a general one, and not confined to particular districts. The new extensions were all proving remunerative, thus showing the wisdom of the Board in availing themselves of every opportunity likely to increase the Company's interests. In many of the older suburbs, the existing mains had been found too small to meet

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 614.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	May 14	6½	Bombay, Ltd.	5⅝—6	+⅛	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	235—240	..	5 0 0
300,000	,,	,,	9	Do. New	173—178	..	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	150—135	..	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
220,000	Stk.	Mar. 12	10⅝	Brighton & Hove Orig.	212—217	..	4 19 1
246,320	,,	,,	7⅛	Do. A. Ord. Stk.	151—156	..	4 19 4
460,000	20	Mar. 31	10	British	39½—40½	..	4 18 9
100,000	Stk.	Aug. 13	6	Bromley, Ord. 10 p.c.	115—120	..	5 0 0
165,700	,,	,,	4½	Do. do. 7 p.c.	88—93	..	4 16 9
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10⅝—11⅛	..	6 4 5
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Aug. 27	5⅛	Commercial Old Stk.	105—108*	..	4 16 3
503,750	,,	,,	5	Do. New do.	100—103*	..	4 17 1
442,947	,,	June 11	3	Do. 4½ p.c. Deb. do.	87—90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	120—125	..	5 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—142	..	4 18 7
575,000	Stk.	Aug. 27	5½	Crystal Palace Ord. 5 p.c.	112—117*	..	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—123*	..	4 1 4
112,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135—138	..	3 12 6
486,090	10	July 29	10½	European, Ltd.	17½—18½	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	12½—13½	..	5 16 8
15,243,200	Stk.	Aug. 13	4⅛	Gas-light and Coke	4 p.c. Ord.	87—89	+2	4 18 10
2,600,000	,,	,,	3½		3½ p.c. max.	83—85	..	4 2 4
3,799,735	,,	,,	4		4 p.c. Con. Pref.	104—107	..	3 14 9
4,193,975	,,	June 11	3		3 p.c. Con. Deb.	87—89	..	3 7 5
2,8,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	June 11	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	May 14	10	Imperial Continental	202—206	..	4 17 1
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	99—102	..	3 8 7
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	113—118*	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A	215—217*	..	4 12 2
718,100	,,	,,	7	Do. do. B	162½—43*	..	4 5 1
306,083	,,	June 26	4	Do. do. Deb. Stk.	110—112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.	4¼—4⅜	..	5 5 3
560,000	100	April 1	5	Met. of Melbourne	5 p.c. Deb.	103—107	..	4 13 6
250,000	100	,,	4½		4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	June 11	3½	Monte Video, Ltd.	9—10	..	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.	102½—103½	+⅜	4 7 0
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.	99—100	−½	3 10 0
300,000	Stk.	May 14	8	Oriental, Ltd.	140—145	..	5 10 4
600,000	5	Mar. 31	7	Ottoman, Ltd.	5⅜—6⅛	..	5 7 8
					* Ex div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	June 26	6⅝	Ply'mth & St'house 5 p.c	123—128	..	4 15 8
851,070	10	April 30	7	River Plate Ord.	11—11½	+⅛	6 1 9
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.	94—56	..	4 3 4
250,000	10	April 17	8	San Paulo, Ltd.	1 ⅛—12½	..	6 8 0
135,000	Stk.	Mar. 12	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	237—240	..	4 3 4
523,498	,,	,,	10	Do. C	237—239	..	4 3 8
103,235	Stk.	Mar. 31	5	Shrewsbury Ord. 5 p.c.	111—114	..	4 7 9
6,150,000	Stk.	Aug. 13	5⅛	South Met., 4 p.c. Ord.	120—123	..	4 6 8
1,180,000	,,	July 10	3	Do. 3 p.c. Deb.	83—50	..	3 6 8
380,940	Stk.	May 14	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton	A. 5 p.c.	115—120*	..	5 0 0
313,020	,,	,,	4½		B. 3½ p.c.	55—100*	..	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.	8—9	..	8 17 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	58—100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.	93—58	..	5 2 10
				WATER COMPANIES.			
780,776	Stk.	June 26	11⅛	Chelsea, Ord.	305—315	..	3 13 0
150,000	,,	,,	5	Do. 5 p.c. Pref.	147—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	135—138	..	3 5 3
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb.	137—142	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.	205—215	..	3 14 5
654,740	,,	June 11	4½	Do. 4½ p.c. Deb.	138—143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	92—55	−1	3 3 2
700,000	50	June 11	10	Grand Junction	10 p.c. max.	122—127	..	3 18 9
310,000	Stk.	Mar. 31	4		4 p.c. Deb.	123—128	..	3 2 6
708,000	Stk.	Aug. 13	10½	Kent	275—285	..	3 13 8
160,000	,,	,,	7	Do. New, 7 p.c. max.	190—200	..	3 10 0
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.	294—299	−3½	3 13 6
406,200	100	,,	8½	Do. 7½ p.c. max.	210—220	..	3 17 3
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb.	122—127	..	3 3 0
500,000	100	Aug. 13	12⅛	New River, New Shares	390—400	..	3 4 0
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb.	121—124	..	3 4 0
902,300	Stk.	June 11	7½	Southwark and Vauxhall	Ord.	235—245	..	3 1 3
126 500	100	,,	7½		7½ p.c. max.	210—220	..	3 8 2
489,200	Stk.	,,	5		5 p.c. Pref.	145—150	−3	3 6 8
1,019,585	,,	Mar. 31	4		4 p.c. A Deb.	122—127	..	3 3 0
1,155,066	Stk.	June 11	10	West Middlesex	273—278	−4½	3 11 11
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	136—141	..	3 3 10
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb.	93—56	−½	3 2 6
					* Ex div.		

the increased demand for gas—thus necessitating the laying of larger ones. They had not yet accomplished all they would like to do in that direction this season; but every effort would be made to overcome the difficulty during the next few months. He had the pleasure, on June 4, in the presence of his co-Directors and the officers of the Company, of formally starting the new gasholder at Rushcutter's Bay. This extension became necessary owing to the great increase of population in the Eastern Suburbs during the past few years. Though it had necessitated an expenditure of nearly £20,000, the money had been well spent; the increased consumption already resulting fully warranting this large outlay. The work, which has been well and faithfully carried out, reflected great credit upon the Company's Engineer, who personally supervised it throughout. The success which had attended the introduction of carburetted water gas at the Head and Mortlake stations, had induced the Board to duplicate both plants, for economic and other reasons. The order was being executed in London; and the apparatus was due to arrive in time to meet the coming winter's requirements. These additions would envolve an expenditure of about £7000. The penny-in-the-slot consumer was a pleasing item in the accounts. In 1897, the experiment was made to meet a class of customers who, unless they could pay as they went along, would not—and, as in many instances, could not—meet quarterly bills. The result had been most satisfactory to the Company. To-day, as the report showed, there were 15,800 prepayment meter consumers on the books; and the number was increasing at the rate of 50 per week. By the end of the year, it was anticipated that the consumption of gas from this source would have reached 120 million cubic feet per annum. The weight of this return in coppers would amount to about 70 tons. In the matter of the Directors' appeal against the rating of land occupied by the Company's mains in the city, he regretted to say that the Full Court had given their decision in favour of the Sydney Municipal Council. Several of the Suburban Councils were also claiming similar powers in their respective municipalities; but whether they had the right to do so, still remained to be decided by the Courts. If the Municipal Councils also gained their cases, the increased amount to be paid for rates would necessarily be very great. Whether the Company would be able to meet this extra demand without raising the price of gas, would be a matter for serious consideration of the Board. The decision of the City Council to install the electric light in the streets of Sydney was very debateable, as Sydney could be favourably compared with any city of similar size in the Empire in regard to its public lighting. In many of the large cities and towns in England and on the Continent, electricity was being superseded by the high-pressure system of gas lighting; the illumination of the latter being greater, while the cost was much less than the electric light. In England, the Newcastle Town Council decided not to increase the number of electric arc lights in the streets, when they found that it would cost the Corporation £12,000 per annum, as against £2384 for gas. The Liverpool Corporation, though owning the electric light plant, had also, in consequence of the cost, recently decided not to further extend this system of lighting, but to use gas; and many other cases could be cited if necessary. Berlin, which was said to be the best lighted city in Europe, was illuminated by means of high-pressure gas-lamps. Light for light, gas was without doubt much cheaper than electricity. But Sydney had gone too far to retrace its steps in the matter; and, in the words of the Chairman of the Aldershot District Council, when declining a request from the consumers to reduce the price charged for the electric light—"The town having invested a large amount of money in order to supply the electric light, it is the duty of the consumer to pay what is necessary." This is poor consolation for the ratepayers. They would be interested to learn that the increase in the number of consumers during the past half year was 1829—the total at present being nearly 60,000. Of gas-cookers, 380 had been sold during the same period; making the number disposed of by the Company alone to date 12,500. Of course, these figures did not represent the actual number of cookers in use, as there are several makes of stoves placed on the market by various agents in Sydney and by local manufacturers. There were 10,914 public lights in use—an increase of 234 for the half year. The demand for gas-engines for motive power had greatly increased of late. During the half year, 62 miles of mains had been laid; the total mileage of mains and service-pipes being now 1750. In conclusion, it afforded him much pleasure to acknowledge the loyal services of the Secretary, the Engineer, and their respective staffs, which had greatly contributed to the Company's success for many years past.

Mr. T. R. Allt seconded the motion, which was unanimously adopted.

The Directors were re-elected; and the proceedings closed with a vote of thanks to the Board and the officers.

GAS COMPANIES AND ELECTRIC LIGHTING.

A Proposal at Farnham.

The Farnham Urban District Council have received the following letter from Mr. Symonds, the Secretary of the Gas Company, with reference to the proposals now being made for the electric lighting of the town.

The attention of my Company has been directed to the offers to light the town with electric light which have been received by your Council, and particularly to the recent letter written on behalf of the Sir Hiram Maxim Electrical and Engineering Company, Limited, a copy of which has appeared in the local papers. My Directors were not aware that your Council contemplated allowing any other authority to undertake the electric lighting; and they have, therefore, not taken the matter into consideration before. They have now, however, done so, with the result that they are advised that they could make arrangements to undertake the obligations of the Order which your Council have obtained, and supply the town with

ARE YOU BUYING
SLOT COOKERS?

It will be WORTH WHILE
writing for our Prices.
They will
INTEREST YOU.

WILLEY & CO., EXETER.

electric light. The Directors are assured that, with their existing works and staff, and with the supply of gas as the motive power, and other advantages which they possess, they could produce electric light much more economically than an outside company; and they therefore have asked me to inform you that, if the Council are agreeable to enter into a contract with them, they will, on its appearing likely that a satisfactory arrangement may result, bring the matter before their shareholders, and seek their authorization to undertake the electric lighting of the town. In laying this matter before the Council, my Directors wish me to remind them that the Company has been eatablished in the town for about seventy years, that the capital is all found locally, and that all the Directors are townsmen. They believe that it will be conceded they have carried out the arrangement for lighting the town in a satisfactory manner. They are now laying the mains for supplying further portions of the district; and they have only just entered into a contract with the Council for the supply and maintenance of incandescent lamps throughout the district, admittedly at a very low price. They have met the Council, immediately after the contract was entered into, by allowing them to vary it by putting lamps in the new road at 100 yards instead of 75 yards interval, as prescribed. They only mention these matters to remind the Council that they are not dealing with strangers, but with a body of men who are as much interested in the welfare and prosperity of the town as the various members of the Council; and they hope that, by the favourable reception of this letter, they will give a preference to a concern which would be managed by the local men, rather than by any of the outside applicants who have addressed themselves to the Council.

The letter is to be considered at a special meeting of the Council which has been fixed for the 22nd inst.

GLASGOW CORPORATION GAS-WORKS.

Charges Against a Station Manager.

A Special Sub-Committee of the Glasgow Corporation which was appointed on Feb. 26 last to investigate and report as to allegations of mismanagement brought forward by Councillor Burgess against Mr. John Wilson, the Station Manager at the Tradeston Gas-Works, have prepared the following report:—

After full and careful deliberation, it was moved by Councillor R. M. Mitchell, and seconded by Councillor Alexander Murray, and agreed to, that the following report be submitted by the Sub-Committee to the Gas Committee as the result of the inquiry (Councillors Blair and Burgess dissenting, so far as regards the proposed findings and recommendation):—Mr. Wilson having admitted some of the more serious allegations brought against him, and, in particular, allegations numbers one and two, which had reference to the employment by him of certain Corporation servants at the Tradeston Gas-Works, in the time of the Corporation, and for which they were paid by the Corporation, to do work for him, at or connected with his private dwelling-house, No. 11, Regent Park Square, Strathbungo, including the making of a dovecot and garden forcing frame (both of which articles, however, had been returned to the gas-works), and a model engine for his son, it is unnecessary to go into the evidence on this part of the case. By his own admission, Mr. Wilson has been guilty of very grave irregularities in regard to these matters, which the Sub-Committee are of opinion cannot be allowed to pass without severe condemnation and censure. With regard to the sum of £8 15s. 10d., referred to in the evidence as having been refunded to the Gas Department, the Sub-Committee do not think Mr. Wilson improved his position by that transaction. The entries in the petty cash book kept at the gas-works having been antedated, suggest that the refunding of this money was an afterthought, and that, but for the fear of the inquiry, the repayment would not have been made. The evidence, however, given by the cashier on this point at the inquiry was not at all satisfactory. The allegations made against Mr. Wilson regarding the making of a sideboard and bookcase were withdrawn by Councillor Burgess, after hearing Mr. Wilson's explanations. The third and fourth allegations against Mr. Wilson, and upon which evidence was taken, had relation to nepotism and victimization. With reference to the first of these allegations, the Sub Committee, while of opinion that Mr. Wilson may have favoured his son, who was an apprentice engineer at the gas-works, in the matter of wages, do not consider that the allegation was in any other respect clearly and fully substantiated by the evidence. As regards the matter of victimization, the Sub-Committee are also of opinion that the allegation made against Mr. Wilson with reference thereto was not proved by the testimony submitted to them in the course of the inquiry. Certain allegations were also made against Mr. Wilson as to coal and other materials having been sent or taken from the gas-works to his house. The transactions, however, with reference to these matters, while being, in the opinion of the Sub-Committee, indiscreet and irregular on the part of Mr. Wilson, do no appear to them to bear the construction sought to be put upon them in the allegations. It was further alleged that Mr. Wilson had been guilty of tampering with some of the men who had been, or were likely to be, cited as witnesses against him in connection with the inquiry; but while some of his methods of dealing with those men may be open to suspicion, the Sub-Committee are of opinion that the more serious charge implied in the allegation has not been substantiated. The Sub-Committee consider that in all the circumstances, and in view of the length of Mr. Wilson's services, and the insignificant amount of the money involved in the allegations, admitted or proved, the ends of justice would be served, and a sufficient warning given to all Corporation servants occupying positions of trust, if Mr. Wilson were censured, and a reduction made in his salary to the extent of £50 a year; and the Sub-Committee recommend accordingly. In concluding this report, the Sub-Committee think it right to state that, in their opinion, the result of the investigation justifies the request made by Councillor Burgess that the several allegations brought forward by him should be fully investigated. They are further of opinion that Councillor Burgess merits the thanks of the Gas Committee for

Half the Battle of life is to make money and save money * * * * * *
The "Eureka" makes money to the Gas Seller and saves money to the Gas Consumer * * * *
It is a good bargain that pleases both sides.

the great amount of time and trouble he has expended in the prosecution of the case, and for the important service he has rendered to the Gas Department in connection therewith.

Mr. Burgess, while dissenting from the foregoing report so far as regards its proposed findings and recommendations, re-submitted the statement which had been submitted and read by him at the meeting held on the 11th of June last, and in which Bailie Stewart concurred, setting forth what, in their opinion, should be the findings and recommendation of the Sub-Committee, and requested that the statement be submitted to the Gas Committee, along with the report adopted by the majority of the Sub-Committee.

This was agreed to; and the documents will come before the Gas Committee to-morrow.

GAS FITTING BY CORPORATIONS.

Some time ago, a Committee was appointed by the local ironmongers and gas-fitters to approach the Coventry Corporation with regard to their action in embarking in the gas-fitting trade. Having interviewed the Gas Committee, they report that the offer to maintain mantles at a fixed charge was adopted in consequence of the great number of complaints received of bad light, which complaints, on being investigated, proved to be caused by dirty or defective burners. The idea was that, by charging for maintenance, the Gas Committee would recover some of the cost incurred by these visits. The Committee offered to hand over this business to the trade, which offer, however, the deputation who waited upon them were unable to accept. The Gas Committee stated that they had no intention of pushing the sale of Welsbach burners; but they offered no explanation as to the reason why a price-list was circulated. As regards the stocking of gas-fittings and the fixing of the same, it was admitted that a small stock had been put in; but the Manager (Mr. Fletcher Stevenson) stated that no work of this class had been done except for slot-meter customers. When the Gas Committee's men, however, were on the premises to fix a meter, they thought no harm was done if they fixed a bracket or pendant, if asked to do so. This point the deputation took up strongly; and in the end they received a promise that the trade should not be pushed, and that when the stock of fittings was exhausted it would probably not be renewed. With regard to the lighting of public buildings and factories, the Gas Committee intend to push this work. They were very firm on the point, and would not give way. On the whole, the ironmongers and gas-fitters feel that their action has not been fruitless. They have enlightened the Gas Committee on some points, and have been met in a spirit which leads them to hope that municipal gas-fitting will not be encouraged in any way. This disposition, they say there is reason to believe, has to some extent been brought about by the action of the trade.

ARC LAMPS OR INCANDESCENT GAS FOR BARNSLEY.

A recommendation of the Electric Lighting Committee that ten electric arc lamps should be erected in place of existing gas-lamps, led to some discussion as to the relative merits of gas and electricity at the last monthly meeting of the Barnsley Town Council. Alderman Holden said the cost of lighting was now very heavy; and they would have to consider whether they had not done as much as they could afford. He desired to know the extra cost of the electric light. Mr. Goodyear asked if the Committee had considered the practicability of incandescent gas lights against electricity. The tendency in other towns, he remarked, was practically to drop electricity in favour of incandescent gas lighting; and he suggested that a portion of the town might be set apart for a test of incandescent gas lighting, so as to get an idea of the comparative cost. Mr. Brady said that where incandescent gas lighting had been adopted, they would see the Corporations were owners of the gas supply. At Barnsley, the position was different, and they had to watch the interests of the town. There was no dislike to consider the efficiency of incandescent lighting; and he thought he might promise some test should be made. He drew attention to a new electric lamp being tested, which was a great deal cheaper than an arc lamp, and gave a better result. The Electrical Engineer (Mr. Bastow) said when they considered that they obtained ten times more candle power from an electric lamp, naturally the cost was rather higher. In most boroughs where the conditions were neutral, the electric light was pushing out incandescent lighting. It is greatly to be regretted, we may remark, that Mr. Bastow did not adduce some evidence in support of this statement.

COMPANIES DISSOLVED OR STRUCK OFF.

From a parliamentary return relating to Joint-Stock Companies just issued, we learn that the following Companies were dissolved or struck off the register during the year ended Dec. 31 last. It must, however, be pointed out that many of them have, of course, since been re-registered under different titles.

England: Abbots Langley Water-Works Company, Acetylene Light Syndicate, Amalgamated Water Gas Companies, Amersham, Beaconsfield, and District Water-Works Company, Amersham Gaslight and Coke Company, Anglo-Caucasian Oil Company, Anglo-Romano Water Company, Anthracene Committee, Ashover Water Company, Automatic Gas-Cooker Syndicate, Benfleet District Water and Gas Company, "Best" Incandescent Gas Share Syndicate, Birmingham Acetylene

CAPITAL! CAPITAL! CAPITAL! CAPITAL!

WE PROVIDE GAS COMPANIES

WITH

Capital Outlay—See our Deferred Payment Systems.

Capital Stoves—Admittedly superior productions.

Capital Consumption—By the popular use of our Gas Stoves.

Capital Dividends—As demonstrated by innumerable Companies that have adopted progressive methods.

WRITE US. WRITE US.

CANNON IRON FOUNDRIES, LTD.,

Gas-Stove Department,

DEEPFIELDS, Near BILSTON, STAFFS.,

And Bath House, 57-60, Holborn Viaduct, London, E.C.

Lamp Company, Blaenau Festiniog Gas Company, Borough of Marylebone Gas Consumers' Company, British Incandescent Mantles, Buffington Acetylene Gaslight Company, Caerleon Gas Company, Carbide of Calcium Supply Syndicate, Carbide Development Syndicate, Caterham Gas Company, Chagford Gas Company, Church Stretton Water-Works Company, City of Messina and District Water-Works, Clifton Water Supply Company, Compressed Gas Company Syndicate, Continental Gas and Water Company, Continental Water and Electrical Power Syndicate, Coventry Gas-Fitting, Electrical, and Engineering Company, Coxhoe Gas Company, Crawley Gas Company, Crowland Gas and Coke Company, Crown Incandescent Gaslight Company, Cullingworth Gas Company, De Mare Incandescent Gaslight System, Duffield, Allestree, and Quarndon Gaslight and Coke Company, Eagle Range and Gas Stove Company, Farnsfield Gaslight and Coke Company, Fourness Gas Process Syndicate, Gas and Electric Light Consumers' Protection Association, Gas Economizing Foreign Patents, Gas Enrichment and Solar Oil Company, Gas Light Improvement Company, Gasorcoal Stove Company, Gefle Gas Company, General Acetylene Syndicate, Haverhill Gas and Coke Company, Hemel Hempstead Water-Works and Laundry Company, Honley Gas Company, Hungerford Gas and Coke Company, Incandescent Fittings Company, Incandescent Supply Association, Jersey Water-Works Company, Kinver Gas Company, Kovno Water-Works, Langport Gas Company, Leeswood Cannel and Gas Coal Company, Liverpool Meter Company, Llangefni New Gas and Coke Company, Manchester Acetylene Gas and Carbide Company, Manchester Gas Cooker, Meters Syndicate (America), Middlesborough Water-Works, Moscow Metropolitan Gas Company, Newtown and Llanllwchaiarn Gas and Coke Company, "Nonpareil" Automatic Gas-Meter Company, Over and Wharton Gas Company, Owston Ferry Gas Company, Pateley Bridge Gas and Water-Works Company, Patent Bitumenized Water, Gas, and Drainage Pipe Company, Patrington Gaslight Company, Petroleum Corporation, Photogenic Gas Company, Plumstead, Woolwich, and Charlton Consumers' Pure Water Company, Pwllheli Gas Company, Read-Holliday Acetylene Company, Rowell Gaslight, Coal, and Coke Company, Sao Pedro (Brazil) Gas Company, Scarborough District Lighting Company, Shoeburyness Gas Company, Sigurdsson Patent Acetylene Gas-Generator Syndicate, Smith's Acetylene Gas Lamp and Generator Syndicate, Somzée-Greyson Intensified Gaslight Company (1898), South Staffordshire Mond Gas Syndicate, Stocksfield Water Company, Sunlight Incandescent Gas-Lamp Company, Swansea Compressed Gas Company, Towyn Gas Lighting and Coal and Coke Company, Trowbridge Water Supply Company, Valparaiso Water-Works Company, Wetherby Gaslight Company, Whitechurch Canonicorum Water Company, Withernsea Pier, Promenade, Gas, and General Improvement Company, World Gas and Electric Syndicate, Yoxford Gas Company. Scotland: Carnwath Gaslight Company, Cove and Kilcreggan Gas Company, Mechanical Retorts Company, Newport Gaslight Company. Ireland: Boyle Gaslight and Coke Company, Letterkenny Gas Company, Randalstown Gaslight Company.

POSITION OF THE TEIGNMOUTH GAS-WORKS.

A statement as to the financial position of the gas-works was submitted to the Teignmouth District Council last Tuesday. It showed that, for the six years ended March 31 last, the expenditure had been £35,528, and the receipts £34,244—leaving £1284 to be borne by the district rate. The loss on the quarter's working to June 30 last was £307. Mr. W. M. Bird, the Chairman of the Gas Committee, said the latter loss was due to the decreased consumption in the June quarter as compared with the autumn and winter. The Manager's monthly statements showed that there was undoubtedly a profit being made at the works; but behind it was a ledger account showing a deficit on the undertaking. This debt was hanging like a millstone round the neck of the department; and they had to lighten it as much as possible. Should they put another 2d. per 1000 cubic feet on the price of gas, or leave the matter as it was, trusting that with their increased plant and the ingenuity of the Manager (Mr. Gray) they would be able to pay off a certain amount of the debt? No blame could be put on the Manager for the financial position; nor could it be said that he had been misleading the Council. Mr. Gray remarked that he could not be supposed to know the financial position of the works when he came to them a little over two years ago, and when, it was now evident, the liabilities were over £2000. The profits on the actual working during the last two years had been reported by him from time to time. The Clerk said that in 1899 a profit of £1185 was shown. They had, however, a lot of accounts hanging over which had to be paid the next year. He thought the Auditor would insist on the debit balance being worked off. Further discussion took place as to the most desirable course to pursue, with the result that it was decided to leave matters as they are; a proposal to increase the price of gas by 2d. per 1000 cubic feet not being persisted in.

PROTECTION OF WATER SOURCES AT BRISTOL.

Local Government Board Inquiry.

An inquiry was recently held, on behalf of the Local Government Board, by Mr. E. P. BURD, one of their Inspectors, relative to certain bye-laws which have been framed by the Bristol Water Company for the protection of their sources of supply, and to the confirmation of which objection has been raised by a number of landowners.

Mr. BALFOUR BROWNE, K.C., appeared for the Water Company; Mr. F. E. WEATHERLY represented the Bristol Charity Trustees; Mr. SEYMOUR WILLIAMS attended on behalf of the Rural District Council of Clutton and the Parish Council of Ubley; and the two last named gentlemen and several others appeared for landowners.

MILBOURNE'S

PATENT LUTELESS

PURIFIERS

SAVE

GAS, GROUND SPACE, & CONNECTIONS.

ERECTED OR IN HAND AT THE FOLLOWING GAS-WORKS:

WREXHAM, DORKING, MITCHAM, RUGBY, EVESHAM, BOLOGNA (ITALY), SEDGELEY, VALPARAISO (CHILI), BANGOR (IRELAND), DRAYCOTT, BRITISH GAS COMPANY (ETRURIA STATION), &c., &c.

SOLE MAKERS—

C. & W. WALKER, LTD.,

Midland Iron Works:
DONNINGTON, NEWPORT, SALOP.

London Office:
110, CANNON STREET, E.C.

Mr. BALFOUR BROWNE said he did not consider it necessary to make any opening speech, but he proposed to read the Acts of Parliament under which the bye-laws in question were authorized. He thought a great number of his opponents were present under a misapprehension in regard to the nature of the inquiry. The Yeo reservoir of the Company was authorized by an Act passed in 1889; and as it was made in a district which was cultivated, and where there was a certain, though not a large, population, it was found necessary to take precautions for preserving the purity of the water. But the provisions then inserted were afterwards thought not to be effective; and in 1900 another Act was obtained, under which the bye laws they had to consider were made. All the Company desired to do was to use the power conferred by section 3 of making the bye-laws, which were sent to the Local Government Board for approval, and which, he submitted, were covered by the Act. If they found anything that was not covered, the Local Government Board would be entitled to exercise their discretion and strike it out. It was clear that the Company had power to take steps to maintain the purity and prevent the pollution, contamination, or discoloration of the waters flowing upon lands within their drainage area; and the section of the Act named provided that bye-laws made under it might impose penalties on any person or persons offending against them. These were their powers; and he ventured to say that the bye-laws did not go beyond them. It was provided that they were not to take effect until they had been confirmed by the Local Government Board, whose functions were to see, first of all, that the bye-laws were within section 3 of the Act of 1900; and where he ventured to submit that his friends who were opposing were wrong, was that they suggested that a greater number of other things should be done entirely outside the section—for instance, that the Company should purchase their properties. This had nothing to do with the present inquiry. In the Company's Act of last year, a new provision was introduced. Section 19 provided that "no lands in any drainage area as defined in the Act of 1900 shall be subject to any bye-law made under the said Act, nor shall the owner or occupier, or any other person interested in any such lands, be required to conform to any such bye-law . . . until the Company shall have served the notice . . . and then only in respect of lands specified in such notice." He ventured to think that the limits of the inquiry that day must be very narrow indeed. The Inspector would not go into the question of whether or not the compensation provided would be sufficient, because this must be left to be determined hereafter. The whole question was whether the bye-laws the Company had made were within their statutory powers, and whether there was anything unreasonable in them. The bye-laws as framed were, he contended, reasonable, and within the powers of the Company; and therefore he asked the Inspector to recommend the Local Government Board to approve of them.

Mr. WEATHERLY then proceeded to call witnesses against the confirmation of the bye-laws. It was generally to the effect that land could not be used in a tenantable way if they were passed.

Mr. *E. P. Squarey*, an Estate Agent in Salisbury, said the proposed bye-laws appeared to threaten the land with sterility by the exclusion of stock; and depreciation in the value of property would be the result. If, in the application of the bye-laws, a district were "proclaimed," there would be reflected disability on neighbouring land, which would not be covered by compensation.

Mr. *G. Gibbons*, the Chairman of the Clutton Rural District Council, said he objected to the bye-laws as unworkable, and calculated to prejudicially affect the district. They were bound to have a very serious effect on the rateable value of land. He cited instances where grass lands had suffered through no cattle having access to them.

In cross-examination, witness acknowledged that there had been an increase in the rating through the construction of the Company's reservoir.

Other witnesses testified to the restraints which the bye-laws would impose on the management of stock, and declared that this would prejudicially affect their farms.

Mr. BALFOUR BROWNE said that where there was no possible source of pollution, the Company did not mean to carry the bye-laws into effect. They had to pay where they put them in force, and they were not going to do this unnecessarily.

Mr. WEATHERLY contended that the Company were asking not only to control the farmer in the uses of his land, but to destroy it altogether. Was it not obvious that the Company did not mean the parties affected to get the full amount they suffered? If they did, they would buy them out. He mistrusted the proposals put forth.

Mr. WILLIAMS argued that the effect of the bye-laws would practically be to make a large portion of agricultural land in this district derelict.

Mr. STURGE, on behalf of certain landowners, said that the proposals raised a very difficult legal question as to how far compensation under the Lands Clauses Act would apply to a case of this sort.

Mr. BALFOUR BROWNE, in reply, said that evidence which had been given was entirely irrelevant. If people were not doing anything to pollute the stream—if they were not doing anything by which impurity would get into the reservoir—the Company need not put the bye-laws into force. As to the question of compensation, the Lands Clauses Act could give full compensation for everything. The Company had spent £52,000 in drainage works in the district; and what was the use of this, if any man could put refuse into their works? The bye-laws did not go beyond the Company's Act of Parliament.

The inquiry then closed.

Ottoman Gas Company, Limited.—The Directors report that the gas-rental for the past half year amounted to £11,914, against £11,572 in the corresponding period, and that the net profit was £2712. The amount standing at the credit of the profit and loss account is £4524, which the Directors recommend shall be dealt with by paying a dividend at the rate of 7 per cent. per annum on both classes of shares, and carrying forward £1899.

No. 26—New Model.
"SYPHON" RADIATOR.

PURE HEAT.

WITHOUT SMOKE OR SMELL.

CLARK'S PATENT
"SYPHON" RADIATORS.

NO FLUE - - -
- IS REQUIRED.

No. 24—New Model.
"SYPHON" RADIATOR.

VERY POWERFUL STOVES
OF ARTISTIC DESIGN.

WRITE FOR CATALOGUE OF NEW DESIGNS FOR SEASON 1903-4.

S. CLARK & Co., Patentees and Makers, Compton Works, Canonbury Road, Highbury, and Syphon Works, Islington, LONDON, N. Show-Rooms: 58, Holborn Viaduct, E.C.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Applications for the vacant post of Manager of the Broughty Ferry Corporation Gas-Works were to be lodged by last Saturday; and on Monday night a special meeting of the Town Council was held to consider the list. It was reported that 32 had come in, which is one more than the number who applied the last time there was a vacancy. The Council, it is said, after a cursory glance at the applications, agreed to leave them in the hands of the Town Clerk to be tabulated. They will come before the next ordinary meeting of the Council; and then a short leet will be made up. One report states that most of the applications come from managers in England and Wales, but that there are several local men among them. A full list of the applicants' names was published in a Dundee newspaper yesterday.

At the Grangemouth Town Council last week one of the councillors reported that he had had an interview with a Director of the Grangemouth Gas Company, who told him that the Company were willing to put themselves in a position to negotiate with the Town Council with reference to the transfer of their undertaking, provided the Town Council intimated their intention to open serious negotiations upon the subject. Thereafter notice of motion was given that it be remitted to the Lighting Committee to consider and report as to the desirability of the Corporation acquiring the undertaking of the Company.

The accounts of the Aberdeen Corporation Gas and Electricity Departments for the year ending July 31 have been issued. They show a total revenue of £114,104, as compared with a revenue in the preceding year of £113,082; and an expenditure of £94,724, as against £96,216. The balance carried to net revenue account is £19,380, compared with £18,166. Of the revenue, £89,596 was derived from sales of gas and meter-rents, compared with £93,701; the reduced revenue being due to a reduction of 2d. per 1000 cubic feet in the price of the gas. From residual products, the revenue was £21,404; from house-services, £2028; and from gas-stoves, £920. Of the expenditure, coal cost £57,265, purifying materials £1540, salaries £1340, wages and works £13,844, maintenance of works £286, and plant £5205. The cost of distributing gas, including the wages of meter-inspectors, and the cost of repairing and renewing meters, was £3063. House services cost £1615; and the outlay upon gas-stoves, including wages and depreciation, is set down at £920. Rents, rates, and taxes amounted to £3505, management (including fee fund, salaries, and office charges) to £1720, general charges to £603, discount to £3094, and bad debts to £431. Against the balance of £19,380 has to be set the charges for annuities, interest, reserve fund, &c., after meeting which there remains a surplus to be carried to the current year's account of £997. On the capital account, there was expended during the year £7535, making the total capital expenditure to date £317,845. The quantity of gas made during the year was 641,565,000 cubic feet (which is the largest output in any single year since the Corporation acquired the undertaking); and the gas accounted for was 599,017,000 cubic feet. The percentage of unaccounted-for gas was 6·63, as compared with 5·79 in the previous year, and with 7·13 two years ago. The average yield of gas per ton of coal was 9557 cubic feet. The coal carbonized amounted to 67,131 tons, as compared with 62,507 tons. The average price of coal was 17s. 0¾d. per ton, as compared with 18s. 11d., and with £1 1s. 9¾d. two years ago. There are 17,135 annuities of 5s. each, to meet which requires £4283. During the year, 466 annuities were redeemed, at the price of £3825. The total number of annuities redeemed has been 8865; and the price paid for them £68,337. Borrowing powers have been exercised to the amount of £141,299. Of this sum, £60,934 has been repaid, leaving the mortgage debt at £80,365. The Gas Committee also manage the Electricity Department. The income is stated to have been £30,336, and the ordinary expenditure £14,791; leaving a balance of £15,544. But from this there falls to be deducted £5274 for interest, £5066 for depreciation, and £3471 for sinking fund, which leaves a sum of £1701 to be carried to reserve fund, raising it to £9557. The sinking fund stands at £12,653. The amount borrowed on mortgages has been £156,440; and the amount of mortgages redeemed by sinking fund, £12,653—making a total of £169,093. The amount expended on works (less depreciation written off of £18,839) amounts to £194,079. The quantity of electricity generated was 2,987,487 units, as compared with 1,859,812 units in the previous year. The quantity consumed was: Public lamps, 217,212 units; traction, 1,085,306 units; and private consumers, by meter, 1,274,790 units. The total sold was 2,577,308 units, and the quantity used in the works 160,004 units. The total quantity accounted for was 2,737,312 units, leaving 250,175 units not accounted for; the percentage being 8·37. The gas accounts, of which it must be said that thay show how carefully the undertaking has been looked after during the long absence of the Manager (Mr. A. Smith), were considered by the Gas Committee on Thursday, and were approved. The Committee agreed to recommend the Town Council to grant a retiring allowance of £250 a year to Mr. Smith. They also resolved to retain the price of gas at 3s. per 1000 cubic feet.

The Manager of the Perth Water-Works has reported a serious leakage in one of the reservoirs supplying the city. It is the middle-level reservoir which has given way. A portion of the south wall has fallen in; and there is leakage in the east wall and in the outlet-pipe. The loss is equal to 12,950 gallons per day, out of a reservoir holding 174,450 gallons. It is not so much the loss of water which is felt as the risk of doing damage to other properties. The Manager makes various proposals for remedying the defects, along with which he couples proposals for extension while the reservoir is under construction. For the works suggested, the estimated costs vary from £275 for lining the reservoir to £12,000 for extending it so as to make it of a capacity of 2 million gallons, and the procuring of an additional triple-expansion pumping-engine. The Manager's suggestions have not yet been considered by the Council.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN.	1,250,000	ST. CATHERINES (Remodelled) .	250,000	ACCRINGTON.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT. . .	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA. . . .	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract) . .	750,000
WINDSOR ST., BIRMINGHAM (Second Contract) . . .	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract) .	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil) . .	125,000
LINDSAY (Remodelled) . .	25,000	CRYSTAL PALACE DISTRICT .	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.) . . .	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract). .	250,000	ENSCHEDE (HOLLAND) . .	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled) . .	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract) . .	750,000
		KINGSTON-ON-THAMES . .	1,750,000	TORONTO (Fourth Contract) .	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 5.

Sulphate of Ammonia.

Though there has been good inquiry, and a fair amount of buying, prices remain £12 2s. 6d. per ton f.o.b. Hull, and £12 5s. per ton f.o.b. Liverpool and Leith. Encouraged by speculative quotations for delivery ahead at below current spot prices, buyers have been persistently trying to get in at a further decline, but with not much success, there being nowhere stocks of any importance. Though buyers hang fire at £12 7s. 6d. per ton, ordinary terms, f.o.b Leith, for October-March delivery, £12 10s. per ton has been paid for January-June. London quotations, Beckton terms, remain £12 7s. 6d. for delivery up to the end of the year and £12 10s. for spring months; but these prices have not been reported paid.

Nitrate of Soda.

This has been advanced to 9s. 10½d. and 10s. per cwt. for ordinary and refined qualities, respectively, on spot, and the price f.o.b. on the West Coast to 7s. per quintal.

LONDON, *Sept.* 4.

Tar Products.

The market continues fairly steady, with the exception of pitch, which is undoubtedly weaker for forward delivery. The demand for this year appears to be fairly good, but offers are being made on the Continent by dealers here at very much lower prices than those at present quoted by makers; and this naturally has a depressing effect on the market, as it causes consumers to defer contracting in the belief that still lower prices will rule. Benzol continues very firm. A considerable quantity of 90 per cent. has been sold at 9d., and makers now ask 9¼d. and 9½d. in London. There are really no stocks at present, and the demand appears good; so that there is some chance of prices improving, although there are rumours from Germany that the output there will be considerably increased owing to the fact that a great number of new coke-ovens are being erected, which will largely increase the production. Toluol and solvent remain precisely in the same position, and there is really no business doing in the ordinary qualities. There is a good demand for heavy solvent with a high flashing point, and a considerable quantity of this has recently been sold for prompt and forward delivery. Crude carbolic acid remains firm. There is a good demand for 60's at 1s. 6d. for delivery up to the end of the year; but crystals are still neglected. In creosote, a large business is reported as having been done in London at fairly good prices, and the demand for export is brisk. In tar, prices continue to have a downward tendency. The depression in pitch for delivery next year is evidently having its effect on the raw material.

The average values during the week were: Tar, 24s. to 31s. Pitch, London, 54s. to 54s. 6d.; east coast, 52s. 6d. to 53s.; west coast, 51s. to 51s. 6d. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. Crude naphtha, 2½d. to 3d.; solvent naphtha, 7d. to 8d.; heavy naphtha, 9d. Creosote, London, 1⅜d. to 1 7/16d.; North, 1¼d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8 10s.; salts, 22s. 6d. to 25s. Anthracene, "A" quality, 1¾d. to 1¼d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is decidedly firm, and there has been a fairly good business doing. The Gaslight and Coke Company still ask £12 7s. 6d. for Beckton make in any position, and could no doubt realize £12 6s. 3d., which, it is reported, they have already declined. The South Metropolitan Company have sold at £12 7s. 6d., and have, since then, declined this price, as they are quoting £12 10s. in any position. In Hull, business has been done at £12 3s. 9d. for prompt; but £12 2s. 6d. was declined for October-December. In Leith, the market is very firm, as makers decline to sell except at an advanced price. The actual value is £12 5s.; but there is no business doing at this. Makers as a rule ask £12 6s. 3d., and in some instances £12 7s. 6d. for prompt. In Liverpool, a fairly good business is reported at £12 5s. for early shipment. The market closes with a very steady tone, but at the same time there are advices from the Continent of offers being made for forward delivery at prices considerably under those ruling on this market.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The coal trade has entered upon a period of the year when some improvement in business is usually looked for. There are, however, various adverse conditions which are likely to check, for the present at least, any very material development of activity. One serious drawback is the continued extremely unsatisfactory condition of the Lancashire cotton trade and the allied branches of industry. In this direction, there is as yet no indication of improvement. The usual holiday stoppages in the various Lancashire manufacturing districts have now come to a close, but short time is being continued at the mills; and this represents largely diminished consumption of fuel for steam purposes. The situation in the iron and engineering trades, which are large users of the commoner qualities of round coal and engine fuel, also remains for the most part unsatisfactory; and this further tends to restrict requirements for the above descriptions of fuel. As a result, notwithstanding some slightly enlarged demand for house-fire consumption, pits throughout Lancashire are still kept on short time; three to four days per week representing the full average working of the collieries. At the pit mouth, the average quoted rates remain unchanged from last month, best Wigan Arley coals ranging from 13s. 6d. to 14s. 6d.; and second qualities, such as the commoner sorts of Arley and

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

Pemberton four-feet, from 11s. 6d. to 12s. 6d. The general report from collieries is that they are moving away only indifferently the lower qualities of round coal for inland consumption in connection with iron-making, steam, and general manufacturing purposes. Prices, however, are being maintained at about 8s. to 8s. 3d. for commoner qualities up to 8s. 6d. and 8s. 9d. for the better descriptions of steam and forge coal at the pit mouth. For shipment a fair trade is being put through, with not quite such low prices quoted; ordinary descriptions of steam and forge coals averaging about 9s. 6d. up to 10s. per ton delivered at the ports on the Mersey. Engine fuel has been hanging at many of the Lancashire collieries owing to the lessened requirements for mill purposes; but there is no great surplus coming upon the market to appreciably affect prices. Quotations for the commoner sorts remain about 4s. 3d. to 4s. 6d., with medium qualities 5s. to 5s. 3d. up to 5s. 9d., and the best descriptions of slack 6s. 3d. to 6s. 9d. per ton at the pit. For all descriptions of coke prices are strong, and in some instances contracts have been secured at a slight advance upon the figures current a few months back.

Northern Coal Trade.

There is a fair demand for coal; but it seems to be less pressing than it was, and orders for delivery forward do not seem to be so numerous. In the steam coal trade, best Northumbrian varieties are easier at from 10s. 9d. to 11s. per ton f.o.b.; second-class steams are 9s. to 9s. 3d.; and steam smalls are about 5s. 6d. There is a full production of steam coals; and for the season it seems to be well taken up. In the gas coal trade, one or two small contracts have been settled for export, at prices which are a few pence lower than the sales they succeed. For occasional cargoes, Durham gas coals are now quoted from 8s. 6d. to 9s. per ton f.o.b, according to quality; and there is an increase in the demand, which should make itself more felt in the course of a week or two. The supplies, however, seem plentiful at present, and thus there is not much change probable in the prices. Gas coke is irregular at present; and while in the inland towns the price is easier, yet on the Tyne from about 14s. to 15s. per ton f.o.b. seems to be quoted for good sorts.

Scotch Coal Trade.

Trade is steady; there being little fluctuation either in demand or in price. The most hopeful market at present is the foreign. Home trade is somewhat stiff. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 9d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 238,596 tons—a decrease of 25,712 tons upon the previous week, but an increase of 15,950 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,144,274 tons—an increase of 198,958 tons upon the same period of last year.

Horwich Water Supply.—Intimation has been received that the Local Government Board have sanctioned a loan of £35,000 for the Horwich water scheme. It will provide funds for the construction of reservoirs at Wilderswood with a capacity of upwards of 30 million gallons, and the purchase of a gathering-ground on the moors.

Extraordinary Waste of Water at Sittingbourne.—For several years past Sittingbourne and Milton have, in the summer months, found themselves dangerously short of water, and a good deal of money has been spent in efforts to make up the deficiency. The true cause of the scarcity, however, appears to have been loss in distribution rather than failure in the wells. The facts which came to light a short time ago as a result of a test ordered by the Sittingbourne Urban District Council, are extraordinary. The waste amounts to no less than 18·84 gallons per day per head of the population; only 100,566 gallons being used for domestic and trade purposes out of 372,000 gallons pumped from the main and auxiliary supplies.

Kingsbridge Water Supply.—Another step towards the settlement of the much-discussed question of the water supply of Kingsbridge was taken on Wednesday last, when the District Council signed the lease for the land to be used for the supply. Under the lease, the Council take the land for 500 years at a rental of £55 per annum; and it has been arranged to borrow £3100 to carry out the scheme. Some opposition was offered to the proposal, and a memorial, signed by 34 inhabitants, was presented against it, the suggestion being that it would be better to have a gravitation scheme than one necessitating pumping. The Chairman (Mr. J. S. Hurrell) reminded the Council that they had already had sixteen or seventeen schemes; and the only other which might be said to be in competition with the present one was to bring in water by gravitation from Capton Moor. In order to carry out the scheme, an Act of Parliament would be required; and the cost would be from £20,000 to £25,000. The present proposal had the approval of the Local Government Board; and there was no objection raised by the ratepayers at the inquiry held respecting it.

Preston Water Supply.—The Borough Surveyor of Preston (Mr. T. Cookson), dealing with the town's water supply and works, states that of the four watersheds—the Langden, Hareden, Spade Mill, and Loud—the last has not been used for many years. The Langden and Hareden provide the greater bulk of the water; but, the quantity being limited, it is impossible to obtain the whole amount required from these sources. The surplus is made up from the Spade Mill watershed; and Mr. Cookson recommends that a portion of it should be cut off, which means that this watershed will be reduced from 1027 to 300 acres. He advises the enlargement of the Spade Mill reservoir. After recommending the discontinuance of the present watershed to the Dilworth reservoir, the report touches upon the question of filtration; Mr. Cookson pointing out that, should the Corporation resort thereto, it will be necessary to purchase land on which to construct filters. He thinks it will be wise, when next the town is seeking borrowing powers, to include a sufficient sum to cover the cost of such a purchase. At the last meeting of the Town Council, Alderman Hamilton moved the adoption of the Water Committee's minutes, which included this report; and the motion was carried.

THE "MAIN" SLOT COOKER

With Latest Developments.

Our New Enamelled Plates are Unequalled for Durability and Appearance.

R. & A. MAIN, LTD.,

LONDON, GLASGOW, BIRMINGHAM, MANCHESTER, BRISTOL.

Factories: LONDON AND FALKIRK.

Vyrnwy Water for Wallasey.—From the 24th inst., the supply of 500,000 gallons of water daily will be available for Wallasey through the new Liverpool pipe-line from Vyrnwy. The Wallasey authorities have decided, however, that inasmuch as the lines have not yet been tested, the supply should not begin until three months after such testing.

Gas Explosion at Buckingham Gate.—A serious gas explosion occurred last Thursday at Priors House, a large building on the St. James's Court Estate, Buckingham Gate, which is let out in flats. A young man named May was attending to a gas-meter in the basement, when the explosion took place. May, who was blown a considerable distance, was found to be very badly burned.

Free Gas-Stoves in Birmingham.—A circular will shortly be issued to all prepayment meter consumers by the Birmingham Gas Department offering to supply and fix gas-stoves free of charge; the size of the stove to depend upon the size of the family. As there are some 26,000 penny-in-the-slot meters in use in the city, this step will no doubt result in a very large demand for cookers.

Public Lighting of Rochdale.—The Accountants called in to audit the Rochdale Corporation accounts (Messrs. Ashworth, Mosley, and Co., of Manchester) made a suggestion that the cost of the public lighting should be charged by the Gas Committee to the general purposes fund. About £5000 worth of gas is used every year for illuminating the streets; and for many years this has not appeared in the accounts. The Auditors' recommendation recently came before the Gas and Electricity Committee, and it was decided to adopt it.

Street-Box Explosions in Sunderland.—Early on Sunday morning of last week, the few persons who happened to be walking in the neighbourhood of Bridge Street, Sunderland, were startled by a series of explosions caused by a fault in an electric cable. Two street-box covers were blown off; and the services of the fire brigade had to be requisitioned to extinguish the flames issuing from the cable. Three minor explosions, which could be traced to those above referred to, subsequently occurred in other places. Fortunately no one was injured; and the electric lighting was not interfered with.

Reductions in Price.—At the meeting of the Douglas Gas Company last week, the Chairman congratulated the shareholders on the success of the undertaking, and announced a reduction of 2d. per 1000 cubic feet in the price of gas. At Keswick, the price of gas has been reduced from 3s. 6d. to 3s. 3d. per 1000 cubic feet. At last week's meeting of the Newcastle Town Council, a letter was read from the Secretary of the Gas Company stating that it was the intention of the Directors to reduce the price of gas to the whole of the consumers by 1d. per 1000 cubic feet from the readings of the meters in December next.

Public Lighting Scheme for Darfield.—An inquiry on behalf of the Local Government Board was held by Colonel W. L. Coke at Darfield last Tuesday into an application by the District Council for a loan of £400 for the purpose of erecting thirty Lucas lamps. The scheme was opposed by Mr. George Dickinson, a member of the Council, on account of its initial cost and the expense of upkeep. He estimated that thirty lamps, to burn on an average nine hours per night, would cost £7 17s. 6d. a week. Mr. H. Gamwell, the Chairman of the Council, said he was practically "sitting on the fence." The people were anxious to have the streets lighted, and so were the Council.

German Chemical Trade in 1902.—From the annual report of the Berlin Chamber of Commerce, recently issued, it appears that last year the distillation of tar was more active, in consequence of the increased demand for pitch. This material rose in price considerably in England; and in Germany (part of the requirements of which are drawn from England) the quotations were also somewhat affected. Simultaneously, there was a moderate rise in the prices of crude and distilled tar, whereas all the other tar products—impregnating oil as well as the finer products—fell greatly in value. Phenol has been affected especially in the present year, and now stands below 100 marks per 100 kgs.; but also in the case of all the other raw materials of the colour industry—benzol, toluol, xylol, naphthalene, and anthracene—the weakening tendency made itself further felt, in spite of the already depressed condition. The reduction of business that always occurs in the autumn was greater in 1902 than usual, in consequence of the interruption to navigation.

Cheap Gas for Generating Electricity at Hebden Bridge.—At the last monthly meeting of the Hebden Bridge District Council, the Chairman of the Electricity Committee (Mr. J. B. Brown), in moving the adoption of their minutes, defended the action of the Gas Board in supplying the Committee with gas at 1s. 9d. per 1000 cubic feet. He said that what the Board had been striving after for a considerable time—a day load—had now been obtained to a considerable extent. If he were looking out for a customer that would be extremely profitable to the works, he would fail to find one that would be likely to prove as profitable as the bargain made between the Electricity Committee and the Gas Board, which he hoped the Council would confirm. Mr. Crossley said he had been told that water gas could be supplied, and that practically an agreement had been made between the Gas Board and the Committee for its supply at 6d. per 1000 cubic feet. The value of water gas being about half that of coal gas, this was equal to ordinary gas at 1s. How the figures as to the cost of producing electricity would work out when the Committee were going to pay 1s. 9d. per 1000 cubic feet for gas he was unable to say. Some of them had been falsely led into this matter; and though he did not wish to use harsh terms, he felt very painfully the position he had been placed in. He did not think the Council were justified in going any further with the electricity works until fresh figures as to the cost of the production of current were brought before them. Mr. Craven said he did not think the Committee were altogether responsible for the change of policy just mentioned. They were prepared to take the water gas if the Gas Board could deliver it; but the Board told them distinctly that they could not do so in time to be of service. Mr. Brown said Mr. Crossley must remember that the 6d. per 1000 cubic feet for water gas was the price at the gas-works, without any arrangement for conveying it therefrom. The motion was eventually carried.

Right!

Appearance . . RIGHT.

Price . . . RIGHT.

Quality . . . RIGHT.

Then

Richmond's

COOKER

is

RIGHT

for you.

Write

ACADEMY STREET, WARRINGTON, LANCS.
CARPENTERS ROAD, STRATFORD, E.

Fire and Electric Lighting.—Writing last Thursday, the Milan correspondent of the "Daily Telegraph" gives an account of a disastrous fire that broke out the previous night in a big modern establishment producing laces, nets, and curtains by machinery in the outskirts of the city. The whole establishment, which employed 400 men, was destroyed. A short circuit of electric wires seems to have caused the fire. Ten workmen and firemen were badly injured, and several others were more slightly hurt. The damage is estimated at about £100,000.

Gas and Electricity at Southport.—The statement of gas made and sold at Crowlands for the quarter ending June 30 last shows that the make has increased by 1,959,000 cubic feet; while the sale has gone up by 5,610,700 cubic feet. Public lighting in Southport shows a decrease of 179,600 cubic feet, and small increases in Ainsdale and Birkdale, despite the electric lamps in York Road. Southport, however, still uses six times as much gas for public lighting as does Birkdale, which, *pro ratâ* to population and area, shows that Southport is better lighted. The introduction of electricity in Birkdale scarcely seems to have affected the gas consumption. Thus increases in the gas used are reported for private and public lighting, in both of which electricity is now employed; while in prepayment meters and cookers, where electricity is not used, there is a steady reduction of the gas consumption.

Heywood and Middleton Water Board.—Some severe criticisms were passed by the Elective Auditors of Heywood on the management of this Board, at a meeting recently held in the first-named town. One complained that representatives of the Press were excluded from the meetings, and consequently there was no opportunity of publicly discussing the Board's doings. He urged the ratepayers to consider carefully what it cost the borough to provide for the losses sustained by a Board over which they had no control. Ever since its formation the annual losses had continued to increase, and so far as one could judge from the heavy expenditure that was now taking place, they would continue to grow for very many years to come, unless there was a rapid development in both Heywood and Middleton. He ventured to express the opinion that greater economy could be exercised. Another of the Auditors remarked that, from an examination of the accounts of different Corporations, he found that where they owned the water, gas, and electricity works the result was that the rates were almost invariably relieved. But in that district, because they had a Water Board, the rates were raised. It was preposterous for councillors to come before the ratepayers and say they were conducting the undertaking to the best of their ability and judgment. He had profound contempt for the supposed business capacity of the gentlemen sitting upon the Water Board; for he could not conceive that they brought into the conduct of their private affairs such "judgment" as they had displayed there.

Attraction of Light and Water for Mosquitoes.—A former resident in South Africa sends us the following: "The plague of mosquitoes in Essex is causing a certain amount of consternation in that county. One peculiarity of this pest is its fondness for light and water, as every resident in the Tropics is well aware. In the coast districts of Natal, the residents' existence for certain periods of the year is made a burden to them by this insect. The mosquito is much more in evidence at night than in the daytime. In some of the coast villages, where street lighting is still carried on under rather primitive conditions, the lamps are always lit before dusk. He would be a bold man who would undertake the task of lighting half-a-dozen lamps in the darkness, as the mosquitoes would literally devour him. People walking down the streets at night, during the summer, may be observed to cross the road at intervals to escape passing by the lamp-posts, for each one is a centre round which myriads of mosquitoes swarm, and their buzzing can be heard at some distance. The approaches to the sea are literally haunted with the pests at night; and the banks of the streams, which are so plentiful in those parts, are forbidden ground to the human being after nightfall. Some time ago, a line of pipes was laid through the Berea bush to carry a purer stream of water from the hill into the town. The greater part of this is run through pipes; but in the centre of the bush it flows for a certain distance free. The bush is haunted by mosquitoes; and when the line was being laid, 20 per cent. of the men employed were always on the sick-list suffering from the after-effects of mosquito bites. The question of keeping the water supply pure is the biggest problem the village councils in Africa have to face; the finances of many of these places not allowing of the use of mechanical means."

The Directors of Stewarts and Lloyds, Limited, recommend an interim dividend at the rate of 9 per cent. per annum on the ordinary shares for the six months ending June 30.

Messrs. C. & W. Walker, Limited, have received instructions to erect one of their patent purifying machines at the new works of the Hastings and St. Leonards Gas Company now being built at Glyne Gap to the designs of Mr. C. E. Botley. The machine will be capable of extracting all the tar and ammonia, &c., from 2 million cubic feet of gas per day. The new Glyne works, it will be remembered, were the subject of a series of articles in the "JOURNAL" in May and June last.

Messrs. Falk, Stadelmann and Co., Limited., of 83-87, Farringdon Road, E.C., have prepared a new catalogue of their specialities and ordinary fittings in the incandescent gas lighting class; this issue being supplementary to a former one. The book is extensively illustrated, and every article and fitting is priced; so that it should be very serviceable to gas engineers and managers. Special attention is drawn to the large range of fittings that have been designed for inverted gas-burners, of which the firm have now one of their own production, to which they have given the name of "Veritas." These inverted fittings are also applicable to acetylene gas lighting. The "Glow" and the "Edina" lamps are among the new goods; and some fresh and excellent styles of suspension fittings and pendants are found, together with many choice examples of brackets in polished and antique finishes.

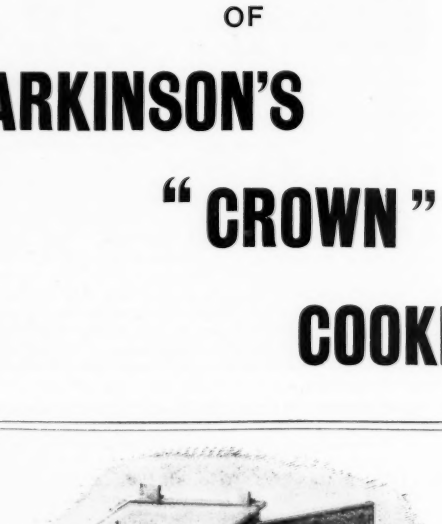
THREE SPECIAL FEATURES

OF

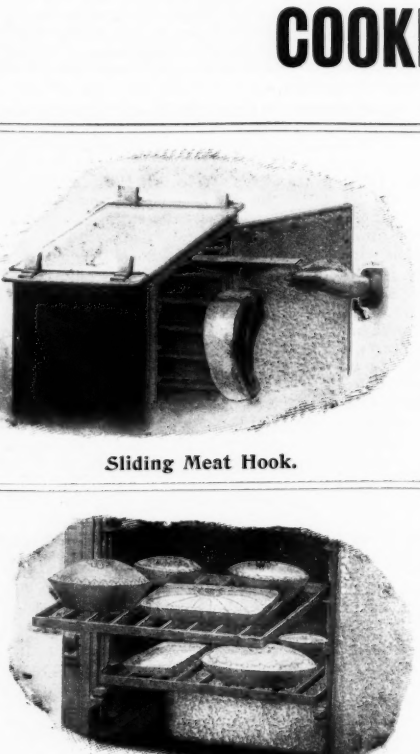
PARKINSON'S

"CROWN"

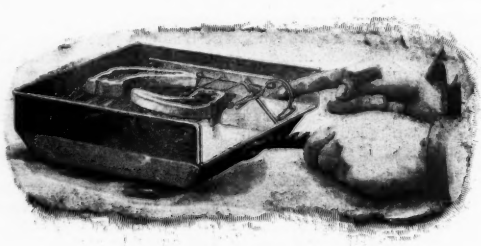
COOKER.



Sliding Meat Hook.



Self Locking Grid Shelf.



Adjustable Grid for Grill.

PARKINSON AND W. & B. COWAN, LTD.

(PARKINSON BRANCH),

LONDON AND BIRMINGHAM.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SUPERINTENDENT FOR EFFINGHAM STREET STATION. Sheffield United Gaslight Company. Sept. 17.
CHEMIST (HEAD) FOR STEEL WORKS. No. 4079.
WORKS SUPERINTENDENT. Rochester, &c., Gas Company. Sept. 16.
GAS LIGHTING INSPECTOR. S. Pontifex and Co., London.
SLOT COLLECTOR. Ilford Gas Company.
MECHANIC (NEW ZEALAND). John Terry and Co., London.
GASFITTER. Waterford Gas Company.
FITTER AND SMITH. No. 4072.

Situations Wanted.

GASFITTER, &c. "Fitter," Southampton.
GAS-STOVE TRADE. No. 4091.
IN A GAS-WORKS. G. Williams, Cleobury Mortimer.
LECTURES ON GAS COOKING, &c. Madame Alting-Mees, London.
MANAGER. No. 4089.

Gas Manufacture Correspondence Classes.

No. 4092.

Pupil Wanted.

No. 4084.

Plant for Sale.

CAST-IRON PURIFIERS AND VALVES. Draycott Gas-Works.
GASHOLDER FRAME WORK. Pitlochry Gas Company.
PURIFIER COVERS. R. Dempster and Sons, Elland.
RETORT MOUTHPIECES AND HYDRAULIC MAIN. Blackrod Gas-Works.

Plant Wanted.

GASHOLDER TANK. No. 4085.

Gas-Works to Let.

No. 4093.

Meetings of Companies.

EAST LONDON WATER-WORKS. Oct. 1. Twelve noon.
OTTOMAN GAS COMPANY. London Office, Sept. 15, One o'clock.

TENDERS FOR

Coal.

BOARD OF TRADE, Whitehall Gardens, S.W. Tenders by Sept. 14.

Coke.

BURY GAS DEPARTMENT. Tenders by Sept. 12.

Covered Service Reservoirs.

BRADFORD CORPORATION. Tenders by Oct. 1.

Gas Oil.

BARROW-IN-FURNESS CORPORATION. Tenders by Sept 23.
ROCHESTER, &c., GAS COMPANY. Tenders by Sept. 16.

Light Oil.

BRIDGEWATER TRUSTEES, MANCHESTER. Tenders by Sept. 21.

Light Railways and Tramways.

BRADFORD CORPORATION. Tenders by Oct. 1.

Masonry Dam, Bye-Pass Channels, Cast-Iron Cylinders, &c.

BRADFORD CORPORATION. Tenders by Oct. 1.

Office, Store, Shed, &c.

BRADFORD CORPORATION. Tenders by Oct. 1.

Pipes, &c.

CHORLEY GAS DEPARTMENT. Tenders by Sept. 15.
HOLDERNESS GAS COMPANY. Tenders by Sept. 14.

Sulphuric Acid.

LEICESTER CORPORATION. Tenders by Sept. 12.

Tar.

GLASTONBURY GAS DEPARTMENT. Tenders by Sept. 18.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half-Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 5s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S "VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.

Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

MADAME ALTING-MEES, Conférencière Diplomée, désire renouer ses relations avec les Compagnies Gazières, et leur offre ses Services pour des Séries de CONFÉRENCES sur l'Application du GAZ aux USAGES DOMESTIQUES.

S'adresser soit au bureau du "JOURNAL" ou à Madame ALTING-MEES, 102, Sinclair Road, Kensington, LONDRES, W.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd. (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL.

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

YOUNG Man seeks permanency. Used to Iron and Compo., Slot Work, Cookers, Fires, Incandescent Burners, &c. Age 28. Good Character. Abstainer. Willing and Obliging.
Address, "FITTER," 30, Cedar Road, SOUTHAMPTON.

WANTED, by a Young Man (aged 18), a SITUATION in a Gas-Works. Has had Eighteen Months' Experience in a small Gas-Works, making between 2 and 3 Millions.
G. WILLIAMS, Pinkham, CLEOBURY MORTIMER.

ADVERTISER seeks re-engagement as MANAGER of medium sized Gas-Works—from 10 Millions upwards. Thoroughly practical in all departments of Gas-Works, as well as Outside Fitting, Mains, and Stoves. Age 36. Good Testimonials and References.
Address No. 4089, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PUPIL.

GAS Engineer in large East Coast Town has a VACANCY for a PREMIUM PUPIL. Exceptional opportunity for gaining a splendid all-round Experience and Training.
Address No. 4084, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-STOVE TRADE.

ADVERTISER (Age 36), 20 Years' first-class Experience in the Trade—Commercial and Manufacturing—is open to an ENGAGEMENT. Smart, energetic, good organizer, and thoroughly understands control of business.

Address No. 4091, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY GUILDS AND L.C.C.

GAS MANUFACTURE EXAMINATIONS.

GENTLEMEN prepared by Correspondence for these Examinations, in Honours and Ordinary Grades. Highest results. Strictly Confidential. Particulars of Prizes, &c., sent on receipt of stamped envelope.

Apply, by letter, to No. 4092, care of Mr. King, 11, Bolt Court, FLEET STREET, E C.

WANTED, First-Class all-round Gas-FITTERS. Only Steady, Competent Men need apply.

State Experience and Wages to J. G. TOOMS, Manager, Gas-Works, Waterford, IRELAND.

GAS-LIGHTING Inspector wanted to take charge of the Lighting and Maintenance of Public Street-Lamps in London.

Reply, stating Age, previous Experience, and Salary required, to S. PONTIFEX AND CO., 17, Coleman Street, LONDON.

SLOT-COLLECTOR Wanted. Previous Experience with Meters necessary. Salary about 25s. per week to commence.

Apply, by letter only, stating Age, Experience, and when able to take up duties, to H. W. ASHMOLE, Secretary, Ilford Gas Company, Cranbrook Road, ILFORD.

FITTER and Smith Wanted, used to the Routine of a Gas-Works. A qualified Mechanic preferred.

Apply, by letter, stating all Particulars as to previous and present Employments, Age, and Wages required, to No. 4072, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for New Zealand, a First-Class MECHANIC. Must have served his time with a first-class Engineer. Must be able to attend to, and repair, the Machinery in a modern Gas-Works, equipped with all Labour-Saving Appliances. Wages 10s. per day. Two Years' Agreement. Age from 25 to 30. Only those having necessary experience need apply.

Reply, by letter only, to JOHN TERRY AND CO., 7, Great Winchester Street, LONDON, E.C.

WANTED, at a Steel Works, a thoroughly reliable HEAD CHEMIST. One with University education preferred. In addition to the ordinary routine of Steel Works Analyses, which must be correctly performed, he should have had experience in Gas Analyses, Analyses and Calculations arising in connection with the Products obtained from the destructive distillation of Coal, use of modern Pyrometers, &c., and the care and revision of records and upkeep of Instruments, Water Analyses and Water Softening, and Micrography. A man is required thoroughly versed in Theory and the Practical application of the same; and he must be a good Organizer.

Apply, stating Salary required, to No. 4079, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SHEFFIELD UNITED GASLIGHT COMPANY.

THE Directors of this Company require a SUPERINTENDENT for their Effingham Street Gas-Works. (The position is vacant owing to the present Superintendent having been promoted.)

The maximum make of Gas at this Station is about 3½ Million cubic feet per day.

Salary £250 per annum, with 'House, Coal, and Gas free.

Applications, marked "Superintendent," stating Age, whether Married or Single, and previous Engagements, to be made by letter only, addressed to the undersigned, not later than Saturday, Sept. 12, 1903.

Testimonials not to be sent till asked for.

HANBURY THOMAS,
General Manager and Secretary.

Gas Offices: Commercial Street,
Sheffield, Aug. 22, 1903.

ROCHESTER, CHATHAM, AND STROOD GAS-LIGHT COMPANY.

WORKS SUPERINTENDENT.

THE Directors are prepared to receive APPLICATIONS for the position of SUPERINTENDENT of their Rochester Works.

Candidates must have had Practical Experience in the control of Workmen, and must have a thorough knowledge of the Manufacture of Coal Gas.

The Salary will be at the rate of £175 per annum, with the use of a House, Coal, and Gas free.

Applications, accompanied by not more than three Testimonials of recent date, stating Age, whether Married or not, and full Particulars of Experience, to be sent to me not later than noon of Wednesday, the 16th of September, 1903, endorsed "Works Superintendent."

J. M. VEEVERS,
Engineer and General Manager.

Gas Offices, Rochester,
Sept. 3, 1903.

SMALL Gas-Works to Let on Lease, in growing District and showing good Returns.

Address No. 4093, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

FOR SALE—Four 10 feet square PURIFIER COVERS.

Apply R. DEMPSTER & SONS, LIMITED, ELLAND.

FOR SALE—20-inch Valves, Tees, BENDS, CROSSES, &c., Second-Hand, Cheap. In Good Condition. Makers, Newton Chambers.

Apply to DUXBURY & Co., MANCHESTER.

FOR SALE—Eight 18-inch Round RETORT MOUTHPIECES, with Lids for same, equal to new. Two 6-feet lengths of 18-inch Round HYDRAULIC MAIN, with 4-inch Arch and Dip Pipes.

Apply to JOHN KELLETT, Manager, Gas-Works, Blackrod, near CHORLEY.

FOR SALE—Gasholder Framework, 25 ft. by 12 ft., with three Columns, Pulleys, Counterbalance Weights, Chains, Guide-Rails, and Two 4-inch Inlet and Outlet Valves. All in good order. F.o.r. at Pitlochry Station.

Offers to HUGH MITCHELL, Secretary, Gas Company, PITLOCHRY.

TO BE SOLD, a Letheby Photometer, Edinburgh Model, with Dibdin 10-candle Pentane Apparatus, by W. Sugg and Co. Quite new; never having been fully used. If preferred, a candle-scale beam can be substituted for Pentane.

Apply to J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BOROUGH OF CHORLEY.

(GAS DEPARTMENT.)

THE Chorley Corporation are prepared to receive TENDERS for the supply and delivery of 200 3-inch and 100 4-inch diameter CAST-IRON PIPES.

Specification may be obtained from Mr. J. W. Allin, Gas Engineer, Chorley.

Tenders, endorsed "Cast-Iron Pipes," to be sent to me on or before Tuesday, Sept. 15, 1903.

The Corporation do not bind themselves to accept any Tender.

By order,
JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
Sept. 4, 1903.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF GAS OIL.

THE Corporation are prepared to receive TENDERS for the supply of about 300 Tons of OIL suitable for the Manufacture of Carburetted Water Gas, delivered free at the Gas-Works Siding, in such quantities and at such times as may be required during the period ending the 30th of June, 1904.

Sealed Tenders, addressed to the Chairman of the "Gas and Water Committee," and endorsed "Tender for Oil," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon on Wednesday, the 23rd of September, 1903.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness,
Sept. 1, 1903.

RAMSGATE HARBOUR.

TENDERS FOR THE SUPPLY OF COAL.

THE Board of Trade invite Tenders for the following quantities of COAL for the service of Ramsgate Harbour: 600 Tons of STEAM COAL of the following qualities the Board of Trade may select:—

YORKSHIRE NORTH COUNTRY.

The Coal to be delivered and stacked into store at Ramsgate Harbour to the satisfaction of the Harbour Master, free of all charges, including 6d. per Ton on the Vessel and 6d. per Ton on the Coal landed.

The first cargo to be delivered not later than the 15th of October next, and as further required in quantities of about 250 Tons on One Month's Notice being given.

A Certificate from the Coal Pit to accompany each Cargo, stating the total quantity shipped, which weight will be accepted provided the cargo is not broken.

All Tenders must be sent in to the Board of Trade (sealed) on or before noon on the 14th of September, 1903, addressed to the Assistant Secretary, Finance and General Department, Board of Trade, Whitehall Gardens, S.W., and marked prominently on the outside, "Tender for Coal, Ramsgate."

Every Tender must be accompanied by a letter signed by two responsible persons willing to become bound with the person or persons tendering in the sum of Fifty Pounds each for the due fulfilment of the Contract.

No particular Form of Tender is prescribed, but no Tender will be noticed unless the prices are inserted therein in words at length.

The Board of Trade do not bind themselves to accept the lowest or any Tender.

By order of the Board of Trade.
T. W. P. BLOMEFIELD,
Assistant-Secretary.

Finance and General Department,
Board of Trade.
Sept. 2, 1903.

WANTED, Offers for Four Cast-Iron PURIFIERS, 6 ft. by 6 ft. by 3 ft., Three Tiers of Grids, bolted together in sections, lated 15 in. by 6 in., Covers of ½ inch Wrought Iron, with Tie-Rods, &c., which are in good condition. Dry-Face Centre-Valve, 5-inch Connections and Lifting Apparatus complete. Erected by W. C. Holmes & Co. in 1887.

Also for Six 5-inch VALVES and a quantity of 5-inch CONNECTIONS. Will be put free on rails at Draycott, M.R.

Can be seen in use at the DRAYCOTT GAS-WORKS, near Derby, where full Particulars may be obtained.

THE Bridgewater Trustees are prepared to receive TENDERS for the LIGHT OIL produced at their Coke-Works for a period of Three, Six, or Twelve Months from the 1st of October next, delivered into Contractor's Tanks at the Trustees' Brackley Siding, on the Little Hulton Mineral Branch of the L. & N.W. Rly.; or their Wharton Hall Siding, on the Pendleton and Hindley Branch of the L. & Y. Rly.

Tenders, endorsed "Tender for Light Oil," to be addressed to the BRIDGEWATER TRUSTEES 4, Chapel Walks, MANCHESTER, on or before the 21st of September.

TENDERS FOR TAR.

THE Gas Committee of the Glastonbury Corporation invite TENDERS for the purchase of the surplus TAR produced at their Works for the Twelve Months commencing Oct. 1, 1903.

Particulars may be obtained from the undersigned.

Tenders, stating Price per Ton on Rail, Glastonbury Station, to be sent in not later than Sept. 18, 1903, addressed to John Morland, Esq., Chairman of the Gas Committee, Glastonbury, and endorsed "Tender for Tar."

D. E. GARLICK,
Manager.

ROCHESTER, CHATHAM, AND STROOD GAS-LIGHT COMPANY.

GAS OIL.

THE Directors invite Tenders for the supply of about 500,000 Gallons of OIL suitable for the Manufacture of Carburetted Water Gas, to be delivered free by barge at the Gas-Works, Gillingham, Kent, in such quantities and at such times as may be required during the period ending the 30th of June, 1905.

Sealed Tenders, endorsed "Gas Oil," with Analysis, &c., to be delivered to me not later than noon of Wednesday, the 16th of September, 1903.

J. M. VEEVERS,
Secretary.

Gas Offices, Rochester,
Sept. 3, 1903.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas and Electric Lighting Committee of the above Corporation are prepared to receive TENDERS for the supply of SULPHURIC ACID, made from either native Sicilian Brimstone, recovered Sulphur, or Pyrites. Specific Gravity in each case to be stated.

The price to include free delivery by rail into Elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road.

Probable quantity, about 1800 Tons, to be delivered as required during the ensuing Twelve Months.

Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Sept. 12, 1903.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E., M.Inst.E.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Sept. 4, 1903.

COUNTY BOROUGH OF BURY.

THE Gas Committee invite Tenders for the removal of their surplus COKE. Estimated quantity, about 5000 Tons; to be removed between the 1st of October, 1903, and the 31st of March, 1904.

Forms of Tender and Conditions forwarded on application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Elton, Bury.

The Gas Committee do not bind themselves to accept the highest or any Tender, or consider any Tender for a quantity of less than 500 Tons, and further reserve to themselves the right to allot the quantity offered in such quantities as they may think fit.

Sealed Tenders, endorsed "Coke," to be sent to the undersigned on or before Saturday, the 12th of September, at Nine a.m.

JOHN HASLAM,
Town Clerk.

Corporation Offices: Bank Street,
Bury, Aug. 22, 1903.

HOLDERNESS GAS COMPANY.

(WITHERNSEA GAS-WORKS.)

CAST-IRON MAINS, &c.
CONTRACT No. 1.

THE Directors of the Holderness Gas Company are prepared to receive TENDERS for the supply of CAST-IRON MAINS and APPENDAGES, delivered f.o.r. Withernsea Station, N.E.R.

Copies of Specification, with Form of Tender and Schedule of Quantities attached, may be had on application at the Offices of the Company, Winchester House, 135, High Street, Hull, or to the Engineer, Mr. J. Holliday, Gas Office, St. Mark's Street, Hull.

A charge of One Guinea will be made for copies of the Specification, &c., which will be returned on receipt of a *bonâ-fide* Tender. Such Tenders, endorsed "Cast-Iron Mains Contract, Withernsea Gas," must be delivered to the undersigned on or before the 14th day of September, 1903.

HENRY COOPER,
Secretary.

Winchester House, 135, High Street,
Hull, Sept. 2, 1903.

BRADFORD CORPORATION.

NIDD VALLEY WATER-WORKS.
ANGRAM STORAGE RESERVOIR.

CONTRACT No. 9.

THE Corporation of Bradford are prepared to receive TENDERS for the construction of a MASONRY DAM (1200 ft. in length by 130 ft. in height above the level of the bed of the River Nidd) at Angram, including Wing Walls, River Walls, Gauge Basin, Waste Channels, Valve Tower, Flood Arches, Roads, &c.

Also Two Miles or thereabouts of BYE-PASS CHANNELS, 9 ft. wide, semi-circular in form, constructed with Concrete and Masonry.

And CAST-IRON CYLINDERS, UPSTAND PIPES, OUTLET VALVES, HEADSTOCKS, FLOATS, GAUGES, WEIRS, and other Works, Apparatus, and Appliances.

Drawings may be seen, and printed copies of Specification and General Conditions, Schedule of Quantities, Form of Tender, with Lithographed copies (reduced) of the more important Drawings, may be obtained at the Office of Mr. James Watson, M.Inst.C.E., Water-Works Engineer, Town Hall, Bradford, on and after Tuesday, the 1st day of September, on payment of the sum of £5, which sum will only be returned on receipt of a *bond-fide* Tender and the return of all the documents.

Sealed Tenders, on the form supplied, together with the Conditions of Contract, Specifications, and Schedule of Quantities, &c., must be sent in intact, fully filled up, to the undersigned not later than Ten a.m. on Thursday, the 1st day of October, 1903, endorsed "Angram Reservoir Tender."

An Engineer will meet intending Contractors at Pateley Bridge Station at Ten a.m. on Tuesday, the 8th, Friday the 11th, Wednesday the 16th, and Thursday the 24th of September, and show them over the site of the Works.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 26, 1903.

BRADFORD CORPORATION.

NIDD VALLEY WATER-WORKS.

LIGHT RAILWAYS.

CONTRACTS NOS. 10 AND 11.

THE Bradford Corporation are prepared to receive TENDERS for the Construction of Thirteen Miles, or thereabouts, of LIGHT RAILWAYS and TRAMWAYS in connection with their intended Angram Storage Reservoir Works.

Plans may be seen, and printed copies of the Specifications, Conditions of Contract, Form of Tender, Schedule of Quantities, &c., may be obtained at the Office of Mr. James Watson, M.Inst.C.E., Water-Works Engineer, Town Hall, Bradford, on and after Tuesday, the 1st day of September, upon payment of £5, which sum will only be returned upon the receipt of a *bond-fide* Tender and the return of all the documents.

Sealed Tenders, on the form supplied, together with the Conditions of Contract, Specifications, and Schedule of Quantities, &c., must be sent in intact, fully filled up, to the undersigned not later than Ten a.m. on Thursday, the 1st day of October, 1903, endorsed "Light Railways Tender."

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 26, 1903.

BRADFORD CORPORATION.

WATER-WORKS.

COVERED SERVICE RESERVOIRS.

THE Corporation of Bradford are prepared to receive TENDERS for the Construction of the under-noted SERVICE RESERVOIRS, including Excavations, Embankments, Masonry, Concrete, Brick, Timber, Ironwork, Valve Chambers, Valves, Pipes, Pipe Tracks, Laying and Jointing Pipes, Roads, Gates, Boundary Walls, &c., &c., viz.:—

No. 1 RESERVOIR,

to be erected in the Parish of Clifton, on the north side of Birkby Lane, Hartshead Moor.

No. 2 RESERVOIR,

to be erected in the Parish of Pudsey, on the north side of Owl Cotes Road.

No. 3 RESERVOIR,

to be erected in the Parish of Calverley-with-Farsley, in a field near Holly Park Mills.

The Three Reservoirs are similar in size and construction, and are each 167 ft. by 60 ft. by 12 ft. deep.

Drawings may be seen, and printed copies of Specification and General Conditions, Schedule of Quantities, Form of Tender, with Lithographed copies (reduced) of the more important Drawings, may be obtained at the Office of Mr. James Watson, M.Inst.C.E., Water-Works Engineer, Town Hall, Bradford, on and after Tuesday, the 1st day of September, on payment of the sum of £5, which sum will only be returned on receipt of a *bond-fide* Tender and the return of all the documents.

Sealed Tenders, on the Form supplied, together with the Conditions of Contract, Specifications, and Schedule of Quantities, &c., must be sent in intact, fully filled up, to the undersigned not later than Ten a.m. on Thursday, the 1st day of October, 1903, endorsed "Service Reservoir Tender."

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 26, 1903.

BRADFORD CORPORATION.

NIDD VALLEY WATER-WORKS.

THE Corporation of Bradford are prepared to receive TENDERS for the Construction of OFFICE, STORE, SHED, &c., to be erected at Gouthwaite Lodge, near Pateley Bridge.

Plan, Specification, &c., may be seen at the Office of Mr. James Watson, M.Inst.C.E., Town Hall, Bradford, on and after Tuesday, the 1st day of September.

Sealed Tenders must be sent to the undersigned not later than Ten a.m. on Thursday, the 1st day of October, 1903.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 26, 1903.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY GENERAL ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., on Thursday, the 1st of October, 1903, at Twelve o'clock Noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED from the 17th of September inst. to the 7th of October, both days inclusive, and RE-OPENED on the 8th of October, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

15A, St. Helen's Place,
Bishopsgate Street, E.C,
Sept. 4, 1903.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 15, 1903, at One o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from Sept. 8 to 15, both days inclusive.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place, Cannon Street,
London, E.C., Aug. 18, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

Price 10s. 6d., Green Cloth, Gilt Lettered.

VOL. LXXXII.

OF THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, &c.

GREEN CLOTH CASES for Binding the Quarterly Volumes of the "JOURNAL," Gilt Lettered, Price 2s.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

THE
PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

THE PERFECT MANTLE COY.,
1c, Aldgate Avenue, London, E.C.

MANUFACTURERS OF THE WELL-KNOWN

SUPERIOR "PERMCO"
MANTLE, IN COTTON AND RAMIE.

Under Welsbach Licence. Can be used legally with any Burner.

Trade Price 26s. 6d. per Gross.
Reduction for Quantities.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

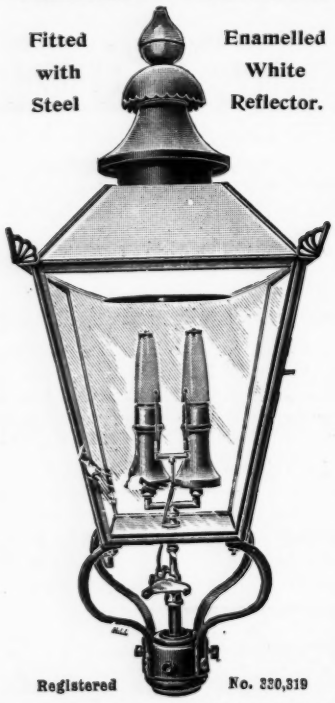
Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.
Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

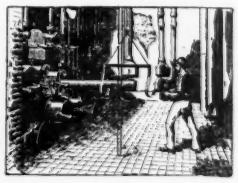
THE
"KILBURN" LANTERN.
Fitted with Steel
Enamelled White Reflector.

Registered No. 320,319
The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.
H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1693 HOP.
Telegrams: "LUMINOSITY LONDON."

High Grade
Gas-Cookers
at
Bottom Prices.
OUR COOKERS
Save you considerable trouble, and
GIVE
Increased Profit to your Company.
THE IMPERIAL STOVE CO.,
LEAMINGTON SPA.
Telegrams: "Imperial, Leamington."
Telephone: One X.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.
GEORGE WALLER & SON,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

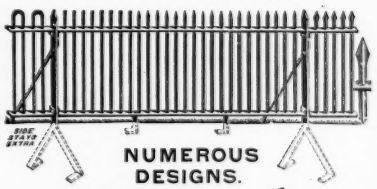
THE
"ROTARY"
STATION METER.
Efficiency
Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

ATTERTON'S
CHARGING APPARATUS
Nearly 40 of these Machines have been

supplied to English Gas Works.
Sole Agents for the United Kingdom:
E. PADFIELD & CO.,
96 & 98, LEADENHALL STREET, E.C.
Representatives:
Messrs. BELL & CO., Engineers, CARDIFF,
Mr. J. B. MACDERMOTT, GLASGOW, and
J. BYRON MACKENNA, DUBLIN.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

BAYLISS,
JONES,
AND
BAYLISS
LIMITED,
Manufacturers of
IRON RAILING, &c.

NUMEROUS DESIGNS.

COKE-BARROWS.

LISTS FREE.
BAYLISS, JONES & BAYLISS.
WOLVERHAMPTON,
And 139 & 141, Cannon St., London, E.C.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
Telegraphic Address: "PARKER LONDON."

THE EXPORT MANTLE

SUPPLIED TO **180** GAS COMPANIES.

Illuminating Power 80 to 700 Candles.

EXPORT MANTLES, 27/- PER GROSS.
EXPORT REMA SILK MANTLES.
EXPORT HIGH-PRESSURE MANTLES.

Special Quotation for Large Quantities.

MANTLES MADE to COMPANY'S own PRESCRIPTION.
Special low Quotations with their own Labels and Stamps.
Burners of all descriptions, solid Brass, from **1/9** per dozen.

NEW EXPORT INCANDESCENT LIGHTING CO., LTD.,
36 MANSELL STREET, LONDON, E.C.
Telephone No. 4946 Central.
Telegraphic Address: "Export Mansell Street, London."

WILSON CARTER & PEARSON, LIMITED,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas and Other Purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

Wrought-Iron

TUBES

And Fittings & Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., LTD., 91 & 93, SOUTHWARK ST., S.E.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

"DURA" "DURA"

INCANDESCENT GAS MANTLE

SECOND TO NONE.

Unexcelled.

	Per Gross.
GUARANTY "DURA" MANTLES, Best Ramie or Cotton, for "C," Gem, and Nos. 2, 3, and 4 Kern Burners ..	30s.
GUARANTY "DURA" MANTLES, Best Ramie or Cotton, Special Double Weave .. .. *(Recommended for Street Lighting.)*	34s.
GUARANTY "DURA" MANTLES, Best Ramie or Cotton, 5 in., for Self-Intensifying Burners	42s.

Special Quotations for Quantities and Contracts.

Unshrinkable.

	Per Gross.
GUARANTY "DURA" MANTLES, Best Ramie or Cotton, for High-Pressure Burners	72s.
GUARANTY "DURA" MANTLES, Best Ramie or Cotton, for Lucas Burners	96s.
"GIMCO" MANTLES, for "C" Burners only	25s.

SUPPORT BRITISH INDUSTRY.

LISTS AND SHOWCARDS ON APPLICATION.

The Guaranty Incandescent Mantle Co., Ltd.,

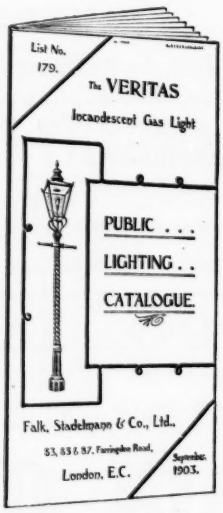
N.T. 27 Streatham.] Phœnix Works, STREATHAM, LONDON, S.W. [T.A. "Unlimited."

"DURA" "DURA"

A Contribution to the Attack on Darkness,

with suggestions.

WE present to gas companies and lighting authorities this volume, just published.



FALK, STADELMANN & Co., Ltd.,
Veritas Lamp Works,
83, 85, & 87, FARRINGDON ROAD,
LONDON, E.C.

SAML. CUTLER & SONS, MILLWALL, LONDON.

GASHOLDERS OF EVERY DESCRIPTION.

CUTLER'S PATENT GUIDE FRAME FOR GASHOLDERS

Adopted for many large and important Gasholders.

CUTLER'S PATENT FREEZING PREVENTER

FOR GASHOLDER CUPS AND TANKS.

In extensive use in English, Continental, and American Works.

LARGE STEEL TANKS A SPECIALITY

Gasworks Plant of every kind.

GAS
THE WINSTANLEY SPECIALTY COY.
ENGINEERS

GAS ENGINEERS.

CONTRACTORS FOR, AND ERECTORS OF, ALL GAS-WORKS PLANT.

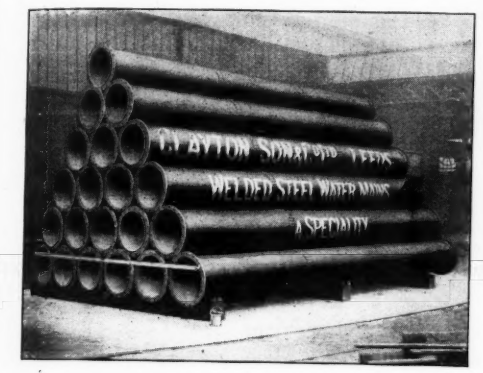
REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.

RESULTS GUARANTEED.

COMPLETE INSTALLATIONS OF HORIZONTAL AND INCLINED RETORTS.

ADDRESS—

NEWTON CHAMBERS, CANNON ST., **BIRMINGHAM.**



WELDED OR RIVETED STEEL PIPES
A SPECIALITY

FOR ALL PURPOSES, TO STAND ANY PRESSURE AND PASS ANY INSPECTION.

CONTRACTS UNDERTAKEN FOR ANY LENGTH OF

PIPE LINE For Water, Steam, Oil, Hydraulic, or Pneumatic Pressure; also for Gas or Air. Any diameter from eight inches upwards.

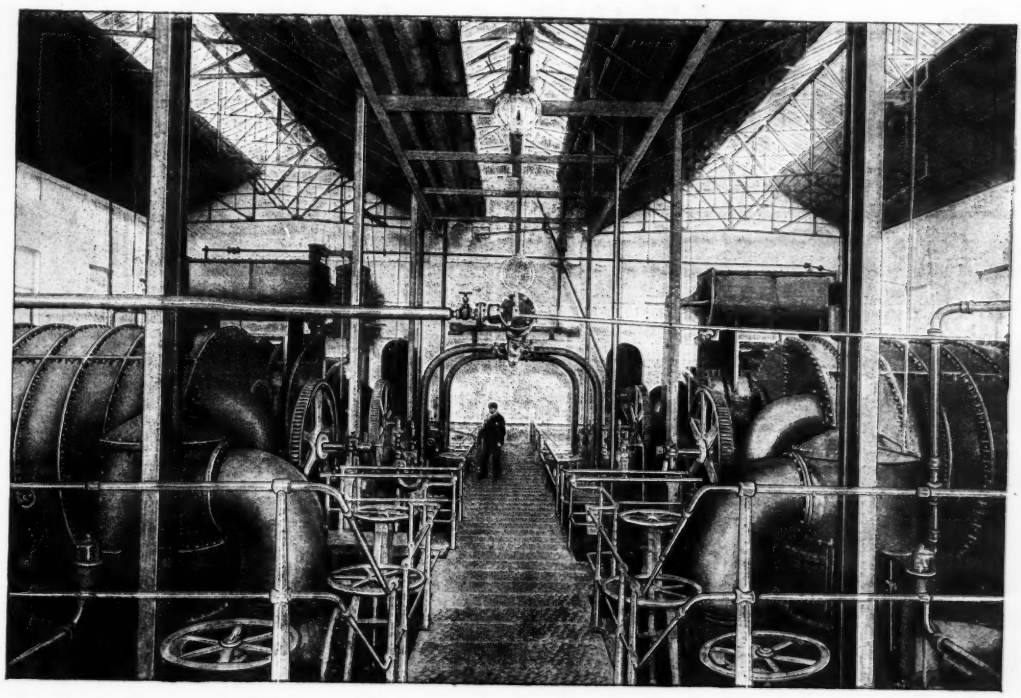
COMPLETE GAS PLANTS.

CLAYTON SON & Co. LTD LEEDS.

ALSO MAKERS OF
STEEL STORAGE TANKS.
Structural Iron & Steel Work,
HIGH-CLASS BOILERS,
For High Pressures, fitted with DEIGHTON'S PATENT CORRUGATED FLUES, giving increased heating surface and highest economy in working.

ON ADMIRALTY AND WAR OFFICE LISTS.

THE GRANTON WORKS, EDINBURGH AND LEITH GAS COMMISSIONERS.



PLANT HOUSE.

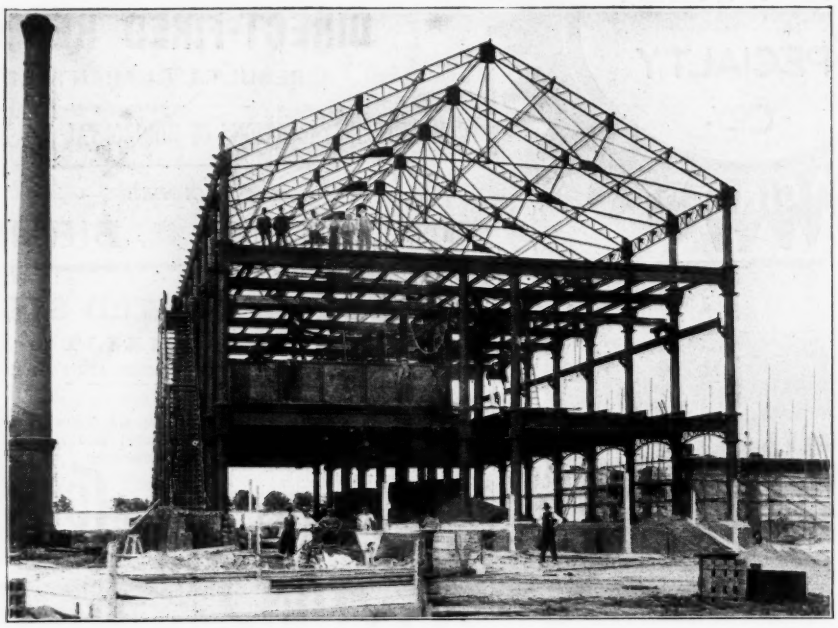
The whole of the Machinery in this House, which includes Patent "NEW" SCRUBBER-WASHERS, MIXING TANKS, and WATER COOLERS for the extraction of Ammonia and Cyanide, Patent PELOUZE and AUDOUIN CONDENSERS, together with all 30-inch Valves, Connections, &c.

Supplied and Erected by **W. C. HOLMES & CO., LONDON & HUDDERSFIELD.**

THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

MAKERS OF EVERY DESCRIPTION OF GAS PLANT.

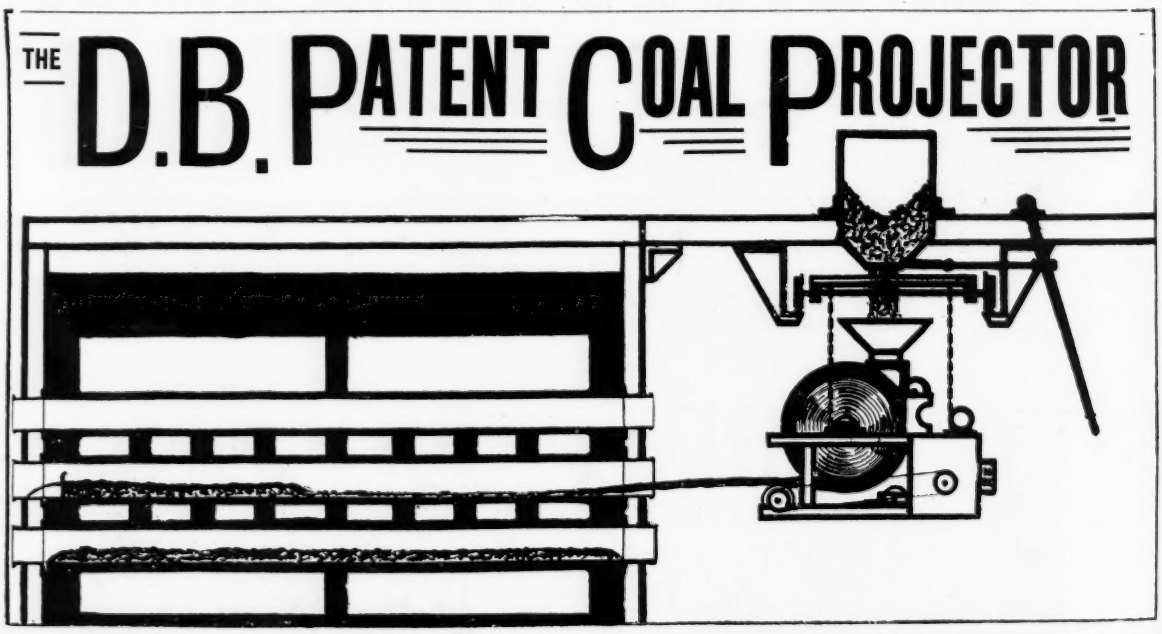


GASHOLDERS AND DRY-SEAL PURIFIERS A SPECIALITY.

PHOTO. OF STAGE-FLOOR PURIFIER-HOUSE TAKEN DURING ERECTION FOR THE UNION DES GAZ AT THEIR WORKS NANTERRE, PARIS.

London Office: 106, CANNON STREET, E.C.

THE D.B. PATENT COAL PROJECTOR



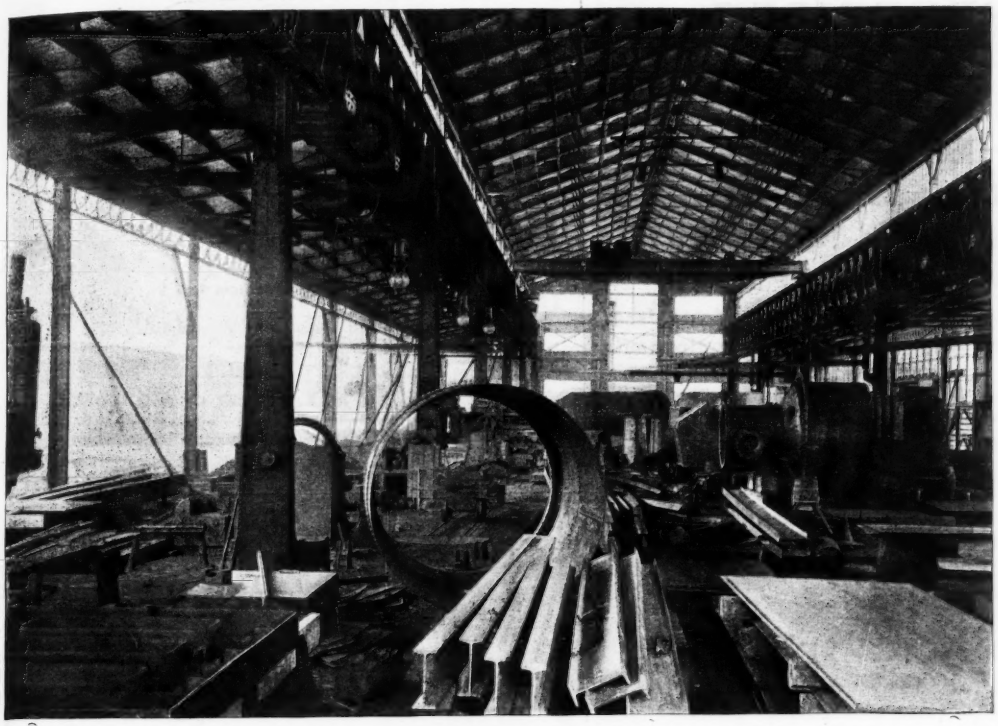
WHAT IS IT?

IT is the Simplest, the Cheapest, and the most perfect Retort Charging Machine ever invented **IT** is a power Driven Machine. **IT** is suitable for the smallest as well as the largest Gas-Works **IT** will charge Retorts 20 feet long as well as shorter ones from one end. **NO** part of the Machine enters the Retort nor comes within 4 feet of it. **ENORMOUS** savings in labour in wear and tear, and in first cost. **IT** will charge upwards of 240 Retorts per hour.

FOR FULL PARTICULARS APPLY TO SOLE MANUFACTURERS,

W. J. JENKINS & CO., Ltd., RETFORD.

GASHOLDERS



AND

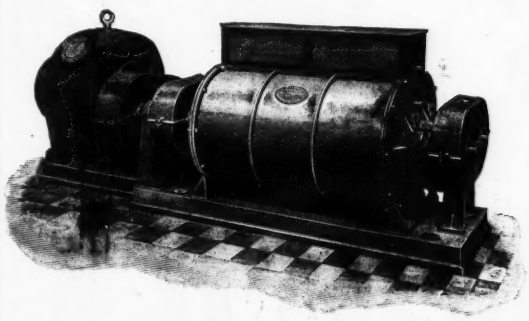
GAS PLANT

OF EVERY KIND MADE UNDER COVER.

Part View of One of our Construction Shops. (*From a Photo.*)

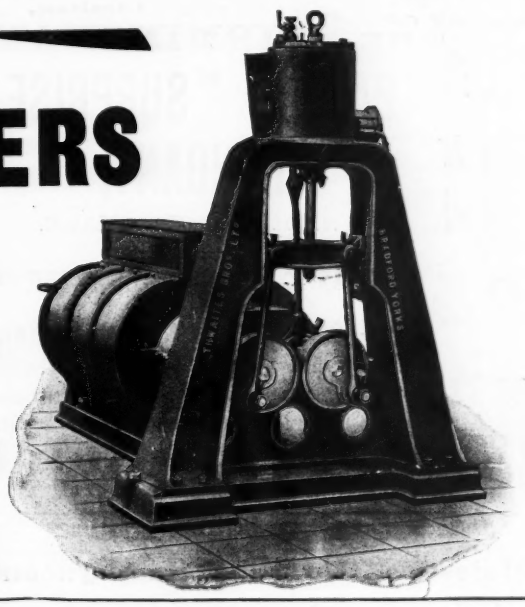
ASHMORE, BENSON, PEASE, & CO., LD., Telegrams: "GASHOLDER." **STOCKTON-ON-TEES.**

THWAITES BROS., LD.,



MECHANICAL ENGINEERS,

BRADFORD.



ROOTS' BLOWERS

IN ALL SIZES TO DELIVER UP TO

25,000 cubic feet of Air per minute.

Driven by Engine, Belt, or Motor.

SPECIALLY DESIGNED AND OF

MODERN CONSTRUCTION

. . For all Processes of . .

GAS MANUFACTURE.

HARPER & MOORES, Limited,

STOURBRIDGE.

MANUFACTURERS OF

Inclined, Horizontal, and Segmental

GAS-RETORTS,

Fire-Bricks, Fire-Clay Lumps, and Tiles

OF EVERY DESCRIPTION.

Also Manufacturers of **Cast-Iron Retorts, Iron Mouthpieces, Pipes, and all necessaries for Gas-Works requirements.**

Telegraphic Address: "MOORES, LYE." Telephone No. 23 Lye.

JOSEPH CLIFF & SONS

(BRANCH OF THE LEEDS FIRE-CLAY CO., LTD.),

WORTLEY, LEEDS.

Cliff's Wortley Silica Bricks.

FOR Arches and Crowns where high heats are required. They contain over 90 per cent. of Silica, and are nearly stationary under the influence of heat, swelling a little rather than contracting. They are not like a Gannister or Dinas Brick, but a Fire-Brick of a highly Silicious nature.

Cliff's Wortley Aluminous Bricks.

THESE are for Side Walls where great wear and tear takes place. Are made of a specially prepared mixture, are high in Alumina, and are what is termed a HARD FIRE-BRICK.

BALTIC WHARF, WATERLOO BRIDGE, LONDON, S.E.

Liverpool: Leeds Street. Leeds: Queen Street.

BEST & LLOYD

MAKERS OF THE **BIRMINGHAM** Limited,

PATENT "SURPRISE" PENDANT,

WITH PATENT SHADE.

OVER 50,000 NOW IN DAILY USE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Used in the private apartments of their

Majesties the King and Queen

at Sandringham.

THOMAS BUGDEN, MANUFACTURER OF

TAR and LIQUOR HOSE, and Special AIR TUBING.

BELLOWS made to inflate a 48-inch Bag under One Minute. Various sizes made.

STOKERS' MITTS. Made from best Tanned Leather.

India-rubber Goods of every description. Leather Bands Oils, &c., Diving and Wading Dresses, Waterproof, Coat Capes, Sewer Boots, and Theatrical Dresses.

Fire-Engine Hose and Appliances.

Best Materials and Workmanship Guaranteed.

Miners Woollen Jackets No. 1, 12/- each; No. 2, 9/6.

Gas-Bags for Mains. All Seams stitched.

71, GOSWELL ROAD, E.C.

"BRIGHT"

Incandescent Mantles.

Best and Strongest Mantles in the World.

27s. PER GROSS.

Special Quotations for large quantities.

— THE —

Bright Incandescent Light Co.

161, Stoke Newington Road,

LONDON, N.

MECHANICAL COAL HANDLING PLANTS

OF ANY MAGNITUDE

MADE AND ERECTED

BY

GIBBONS

BROTHERS

LTD

DUDLEY & LONDON

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

CLAYTON SON & Co LTD LEEDS
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
THE ORIGINAL MAKERS OF
SPIRAL GUIDED GASHOLDERS
MAKERS OF ALL KINDS OF
STRUCTURAL IRON & STEEL WORK. STEEL FRAMED BUILDINGS
ROOFS RETORT FITTINGS
PURIFIERS RETORT LIDS
ANTIFREEZERS for Gasholders
STEEL TANKS
OF ALL SIZES
MAKERS OF THE LARGEST IN THE WORLD.
GASHOLDERS
OF EVERY DESCRIPTION & SIZE.
HIGH CLASS BOILERS FITTED WITH DEIGHTON'S PATENT CORRUGATED FLUES.
Telegrams "GAS LEEDS." London Office 60 Queen Victoria St E.C.

MANNESMANN

LAMP POSTS
made throughout of
WELDLESS STEEL TUBING
including base, ring, and ladder rest.
Light, Strong, Unbreakable, and Cheap.
GAS, WATER, & STEAM TUBES AND FITTINGS.
WELDLESS STEEL SPIGOT & FAUCET PIPES for Gas and Water Mains.
Tubes can be supplied up to 10 inches diameter and in lengths up to 30 feet.
THE BRITISH MANNESMANN TUBE COMPANY, LTD.,
Landore, South Wales.
Birmingham Depôt: 110, COLMORE ROW.
London Office: 110, CANNON STREET, E.C.

PATENTEES & EXPERTS
SAFETY. **REMEMBER.** ECONOMY.
150 ARE AT WORK. MANY REPEAT ORDERS.
DEMPSTER'S IMPROVED PATENT SPIRAL GUIDED GASHOLDERS.
AVOID COLOURABLE IMITATIONS AND INSIST UPON HAVING PATENT SPIRAL PLATES.
THESE PERFECTED SPIRAL GASHOLDERS HAVE STOOD ALL TESTS, & ARE THE SAFEST GASHOLDERS IN THE WORLD. GUIDES & ROLLERS ALWAYS ACCESSIBLE.
"YOUR SPIRAL HOLDER STANDS LIKE A ROCK."
R. & J. DEMPSTER, LTD., MANCHESTER.

JAMES MILNE & SON, LTD.,

GAS ENGINEERS

MILTON HOUSE WORKS EDINBURGH.

LONDON. —— LEEDS. —— GLASGOW.

BARRY, HENRY, & CO.,

— LIMITED. —

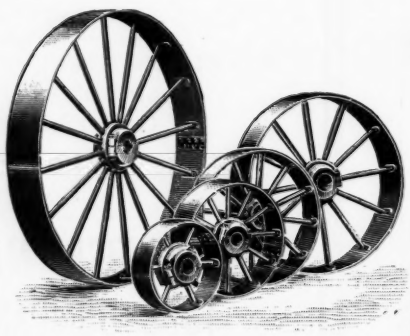
Specialities:

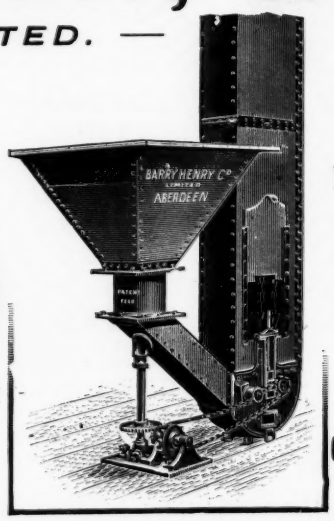
TRANSMISSION OF POWER.

Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings.
Pedestals. & Fixings.

WORKS:

ABERDEEN,
SCOTLAND.





Specialities:

TRANSMISSION OF MATERIALS.

Conveyors
Elevators,
Grinding Machinery,
Motors.

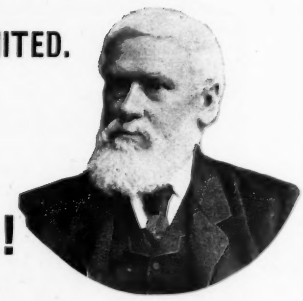
AND

64, MARK LANE,
LONDON, E.C.

CLAPHAM BROTHERS

ESTABLISHED 1837.

LIMITED.



LEST YOU FORGET!

OUR SPECIALITIES ARE IN GREAT FAVOUR.

"ECLIPSE"

WASHER SCRUBBER (Laycock and Clapham's Patent).
WATER TUBE CONDENSER (Clapham's Patent).
RAPID AUTOMATIC FASTENINGS AND **RUBBER JOINT** (Clapham's Patent) FOR

DRY LUTE PURIFIERS.

THE **"NEW CENTURY COVER"** FOR **PURIFIERS.**

SELF-SEALING MOUTHPIECES for Inclined and Horizontal Retorts. **MAINS, VALVES, &c.**

LONDON AGENT: THOMAS B. YOUNGER, C.E., Chesterfield House, 98, Great Tower Street.

WELLINGTON, NELSON, and MARKET STREET WORKS, KEIGHLEY.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and published by him at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Sept. 8, 1903.